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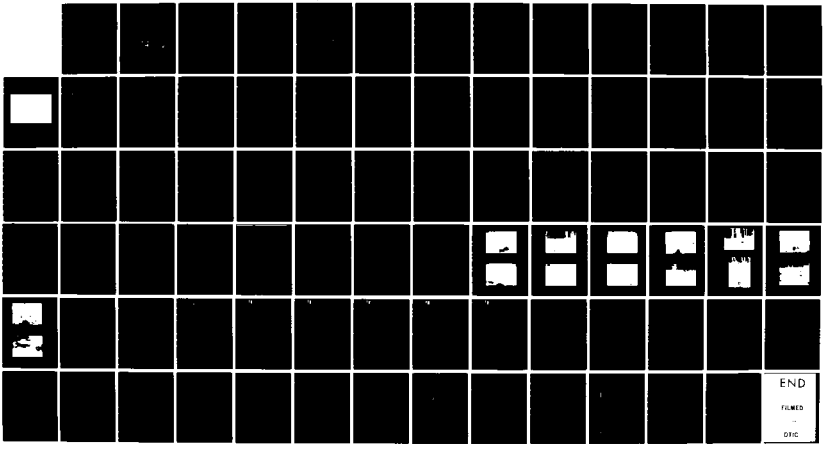

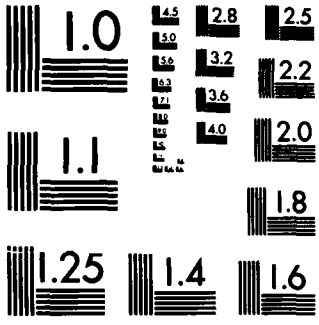

MICROCOPY RESOLUTION TEST CHART
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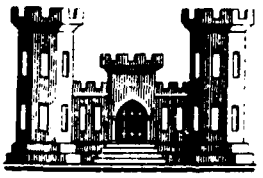
LOWER CONNECTICUT RIVER BASIN
HADDAM , CONNECTICUT

UPPER POND DAM
CT 00433

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEER
WALTHAM , MASS. 02154

APRIL 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00433	2. GOVT ACCESSION NO. AD A144514	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Upper Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE April 1980 13. NUMBER OF PAGES 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Lower Connecticut River Basin
Haddam, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Upper Pond Dam is an earth embankment dam with a maximum height fo 17 feet and a length of 390 feet. It has a storage of 180 acre-feet which classifies this structure in the "small" category. Based on the visual inspection, the Upper Pond Dam appears to be in poor condition. The dam has been classified as having a "high" hazard potential. For the combination of dam size (small) and downstream hazard (high), a range in the magnitude of the test flood of ½ PMF to the PMF is given.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED-E

NOV 14 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Upper Pond Dam (CT-00433) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Upper Pond Dam would likely be exceeded by floods greater than 16 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NOV 14 1980

NEDED-E
Honorable Ella T. Grasso

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. This report has also been furnished to the owner of the project, Apostles of the Sacred Heart of Jesus, Hamden, Conn.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for the cooperation extended in carrying out this program.

Sincerely,

WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer

Codes
or
Special
A-1

UPPER POND DAM

CT 00433

LOWER CONNECTICUT RIVER BASIN

HADDAM, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	CT 00433
Name of Dam:	Upper Pond Dam
Town:	Haddam
County and State:	Middlesex, Connecticut
Stream:	Candlewood Hill Brook
Date of Inspection:	6 November, 1979

BRIEF ASSESSMENT

Upper Pond Dam is an earth embankment dam with a maximum height of 17 feet and a length of 390 feet. The dam embankment left of the spillway is approximately 10 feet in width, with 2 horizontal to 1 vertical upstream and downstream embankment slopes.

The centrally located spillway is 72 feet in length and is a stone masonry structure. Stone masonry training walls approximately 5 feet in height are located at each side of the spillway. The outlet works consist of a concrete gate structure and an outlet channel.

Upper Pond is used for recreational purposes. It has a storage of 180 acre-feet which classifies this structure in the "small" category. The probable impact areas of a dam failure include property along Candlewood Hill Road below the dam. The dam failure analysis determined that only one structure, the Scovill Hoe Company, would experience flooding with a water level of just over 2 feet due to a dam failure. Appreciable economic loss may occur to the Scovill Hoe Company and to areas of Candlewood Hill Road. With the possibility of loss of more than a few lives and the probability of appreciable economic losses, the dam has been classified as having a "high" hazard potential.

Based on the visual inspection, the Upper Pond Dam appears to be in poor condition. There was no movement or settlement of the crest observed. The horizontal alignment is good. The top of the outlet gate structure, however, is lower than the embankment crest. Some erosion was noted at the abutments, adjacent to the spillway section and adjacent to the outlet works. Trespassing on the slopes was not significant. Erosion scarps on the upstream slope extending 1-2 feet above waterline were noted. Several areas of broad shallow erosion on the upstream slope and upstream side of abutments were observed. Brush and many large trees (up to 2.5-ft.-dia.) with extensive root systems were noted on the slopes and crest of the dam. Standing water was observed in an area 35 feet downstream of the toe on the right side of the dam.

For the combination of dam size (small) and downstream hazard (high), a range in the magnitude of the test flood of 1/2 PMF to the PMF is given. A test flood of 1/2 PMF was selected for this project. The maximum spillway capacity without overtopping is 1,728 CFS. The capacity of the spillway is inadequate to pass the 1/2 PMF test flood outflow of 5,195 CFS and would overtop the dam by about 0.9 feet. The spillway can pass about 33 percent of the test flood.

Within one year of receipt of the Phase I Inspection Report, the owner should retain a qualified registered engineer to accomplish the following: 1) Determine and implement procedures for removal of the trees growing on the upstream and downstream faces of the dam embankment and within 25 feet of the downstream toe. The voids left in the embankment after removal of the tree root systems should be properly backfilled with suitable fill materials. 2) Conduct more refined hydrologic and hydraulic analysis to determine the need for and methods of increasing the project discharge capacity. 3) Design and install riprap slope protection for the upstream slope. 4) Additional slope protection should be designed and installed on the left bank of the spillway channel in the area immediately downstream from the spillway crest. 5) The rubble stone wall on the left side of the outlet channel just downstream from the outlet gate, which appears to have bulged toward the outlet channel, should be investigated, repaired and strengthened, if necessary. 6) The crest of the dam in the vicinity of the outlet structure should be filled to restore proper grade and 7) Inspect spillway during period of low flow.

The owner should also carry out the following operational and maintenance procedures: 1) Clear brush from the dam embankment and from the area within 25 feet of the downstream toe. 2) Plant grass where erosion has occurred and unprotected soil is exposed on the crest and downstream slope. 3) Inspect during dry weather the area where standing water was observed (approximately 35 feet downstream from the toe at Sta 3+60) to determine whether seepage is occurring at that location. 4) The voids in the left spillway training wall should be repaired and the sapling growing out of the face of the right training wall should be cut and removed. 5) Institute a program of annual technical inspections and 6) Establish a surveillance program at the site during and immediately after heavy rainfall, and also a downstream warning program to follow in case of emergency conditions at the dam.

S. Giavara, P.E.
President

Registered CT. 7634

This Phase I Inspection Report on Upper Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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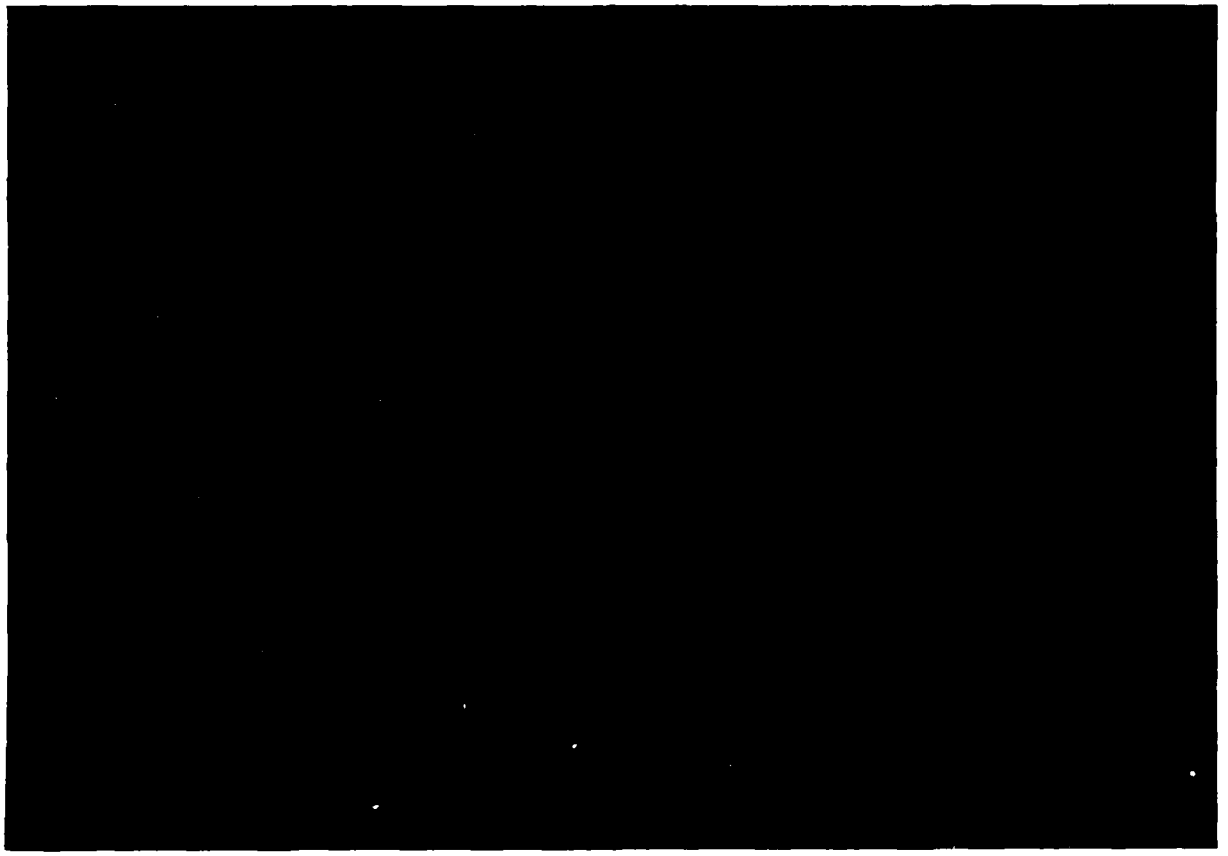
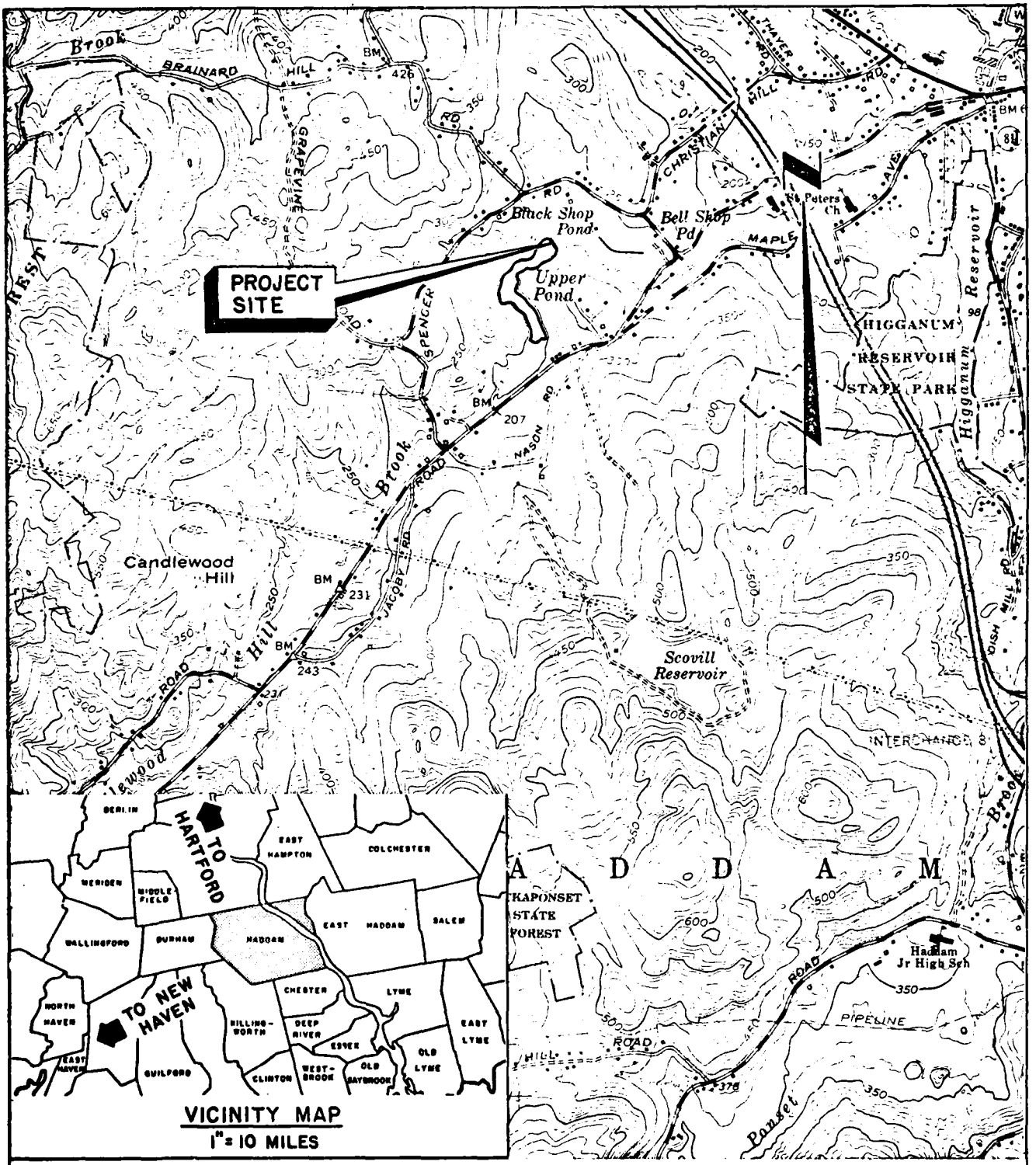
APPENDIXES



OVERVIEW PHOTO
Upper Pond Dam



VICINITY MAP
1" = 10 MILES

SCALE IN FEET
2000 1000 0 2000

UPPER POND DAM
LOCATION MAP
HADDAM , CONNECTICUT

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
UPPER POND DAM - CT 00433

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection through the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Flaherty Giavara Associates, P.C. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of 19 October 1979 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0001 has been assigned by the Corps of Engineers for this work.

b. Purpose.

1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2) Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF THE PROJECT:

a. Location. Upper Pond Dam is located in Haddam, Connecticut on Candlewood Hill Brook. Access to the dam is from Spencer Road. The pond is located approximately 1 mile east of the village of Higganum. The reservoir is shown on the U.S.G.S. Topographic Map "Haddam, Connecticut" at a latitude of 41°29'30" and a longitude of 72°34'42". The Location Map on page vi shows the location of the dam.

b. Description of Dam and Appurtenances. Upper Pond Dam is an earth embankment dam with a maximum height of 17 feet and a length of 390 feet. A stone masonry spillway 72 feet in length is located at the center of the dam. The dam embankment north (left) of the spillway is approximately 10 feet in width, with 2 horizontal to 1 vertical upstream and downstream embankment

slopes. The crest elevation varies from approximately 199 feet NGVD to 200 NGVD. The dam embankment south (right) of the spillway is approximately 10 feet in width. The upstream and downstream dam embankment slopes are approximately 1.5 horizontal to 1.0 vertical. The crest elevation of this portion of the dam is approximately 200.7 feet NGVD. the dam embankment is covered with trees and other vegetation. No riprap protection is provided.

The spillway is 72 feet in length and is a stone masonry structure. Stone masonry training walls approximately 5 feet in height are located at each side of the spillway. Large masonry capstones held together by metal plates and pins comprise the crest of the spillway. The downstream face of the spillway is approximately 12 feet in height. Large sloping stones on the channel banks below the spillway serve to deflect spillway overflow into the channel and away from the downstream embankment slopes.

The outlet works consist of a concrete gate structure and an outlet channel (headrace) which was used to transmit water to a water powered factory downstream of the dam. The remains of the factory were observed at the site. The outlet works is operational and provides a low level drawdown capability at the dam. The concrete gate structure is located within the dam embankment approximately 40 feet north (left) of the spillway. Two manual, gear operated, wooden sluicegates allow water to be passed through the structure to the downstream headrace. The headrace is approximately 20 feet wide, 6 feet deep, and about 500 feet long. Flow in the headrace is contained by an earth dike on the right side and natural ground to the left. The headrace is overgrown with trees but is still capable of transmitting the outflow.

c. Size Classification. Upper Pond Dam has a storage volume of 180 acre feet and a dam height of 17 feet. A storage volume of greater than 50 acre feet but less than 1000 acre feet classifies this structure in the "small" category according to guidelines established by the Corps of Engineers.

d. Hazard Classification. The dam is classified as having a "high" hazard potential. The probable impact areas include the houses along Candlewood Hill Road below the dam. The dam failure analysis determined that several structures, including the Scovill Hoe Company would experience flooding with a water level of approximately 2 feet due to a dam failure. Appreciable economic loss may occur to the Scovill Hoe Company and to areas of Candlewood Hill Road. With the possibility of the loss of more than a few lives and the probability of appreciable economic losses the dam has been classified as having a high hazard potential.

e. Ownership. The dam is owned by the Apostles of the Sacred Heart of Jesus, 265 Benham Road, Hamden, Connecticut, Phone: 203-248-4225. This organization also maintains a convent near the dam site, Spencer Road, Haddam, Connecticut, Phone: 203-345-4827.

f. Operator. The Scovill Hoe Company maintains water rights to this structure, and is responsible for the operation of the dam. The Scovill Hoe Company, located on Maple Street in Haddam, Connecticut, is owned by Mr. R. Fisher, Phone: 203-345-2530.

g. Purpose of Dam. Historically Upper Pond was used for water power for the old Scovill Hoe Factory. This factory was abandoned more than 30 years ago and only the remains are left at the dam site. At present the pond is used for private recreational purposes.

h. Design and Construction History. There is no available design or construction information available for this dam. It is believed that the dam was constructed when the original factory was built during the early 19th century.

i. Normal Operation Procedure. The outlet works are not operated; therefore the water level is maintained principally by the spillway elevation. During the inspection, however, the gates were in a slightly open position. There are no standard operational procedures presently practiced at this dam.

1.3 PERTINENT DATA:

a. Drainage Area. The drainage area of Upper Pond Dam consists of 6 square miles of upland wooded terrain and valley agricultural land. The watershed is generally sparsely developed with some moderate development along the Candlewood Hill Brook valley area. Portions of the watershed comprise the Cockaponset State Forest.

b. Discharge at Dam Site.

1) The outlet works consist of a concrete gate structure with two manual, gear operated wooden sluicegates. The discharge capacity of the outlet works is estimated to be 150 CFS.

2) There are no known records of past floods or flood stage heights at the dam.

3) The ungated spillway capacity at the top of dam - 1730 cfs @ El. 199.

4) The ungated spillway capacity at the test flood elevation - 3660 cfs @ El. 201.6.

5) The gated spillway capacity at normal pool elevation is not applicable at this dam.

6) The gated spillway capacity at test flood elevation is not applicable at this dam.

7) The total spillway capacity at test flood elevation - 3660 cfs @ El. 201.6.

8) The total project discharge at the top of dam - 1730 cfs @ El. 199.

9) The total project discharge at test flood elevation - 5195 cfs @ El. 201.6.

c. Elevation. (NGVD)

1) Streambed at toe of dam.....183±

2) Bottom of cut-off.....Unknown

3) Maximum tailwater.....N/A

4) Recreation pool.....N/A

5) Full flood control pool.....N/A

6) Spillway crest.....195±

7) Design surcharge.....Unknown

8) Top of dam.....199-200.7±

9) Test flood surcharge.....201.6

d. Reservoir. (Length in Feet)

1) Normal pool (Spillway crest).....1,800±

2) Flood control pool.....N/A

3) Spillway crest pool.....1,800±

4) Top of dam.....2,500±

5) Test flood pool.....2,600±

e. Storage. (Acre-Feet)

1) Normal pool (Spillway crest).....85

2) Flood control pool.....N/A

3) Spillway crest pool.....85

4) Top of dam.....180

5) Test flood pool.....195

f. Reservoir Surface. (acres)

1) Normal pool (Spillway crest).....10

2) Flood control pool.....N/A

3) Spillway crest.....10

4) Test flood pool.....30

5) Top of dam.....27

g. Dam.

1)	Type:	Earth embankment with stone masonry spillway
2)	Length:	390 feet
3)	Height:	17 feet
4)	Top Width:	10± feet
5)	Side Slopes:	1.5-2.0 horizontal 1 vertical
6)	Zoning:	Unknown
7)	Impervious Core:	Unknown
8)	Cut-off:	Unknown
9)	Grout Curtain:	Unknown

h. Diversion and Regulating Tunnel.

1)	Type:	N/A
2)	Length:	N/A
3)	Closure:	N/A
4)	Access:	N/A
5)	Regulating Facilities:	N/A

i. Spillway.

1)	Type:	Broad crested stone masonry, vertical downstream face
2)	Length of Weir:	72 feet

3)	Crest Elevation:	199-200.7 feet
4)	Gates:	None
5)	U/S Channel:	Reservoir
6)	D/S Channel:	Natural channel with gravel and cobble bed

j. Regulating Outlets.

1)	Invert:	193± N.G.V.D. (Est.)
2)	Size:	Two @ 2'x3' (Est.)
3)	Description:	Two wooden sluicegates
4)	Control Mechanism:	Manual gear operation

SECTION 2 - ENGINEERING DATA

2.1 DESIGN:

No engineering data has been found to provide any information about the design of Upper Pond Dam.

2.2 CONSTRUCTION:

No information relative to the construction of the dam is available. Information presented in this report was primarily obtained by interviews and direct field measurements of the existing dam.

2.3 OPERATION:

Formal operation records are not available for this dam.

2.4 EVALUATION:

a. Availability. There are no plans, specifications or computations available from the owner or State regarding the design, construction or subsequent repairs and modifications to this dam.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of the dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgement.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS:

a. General. The dam is an earth embankment with a stone masonry spillway section located in the center of the embankment. Based on the visual inspection, the Upper Pond Dam appears to be in poor condition. There was no movement or settlement of the crest observed. The horizontal alignment is good. The top of the outlet gate structure, however, is lower than the embankment crest. Some erosion was noted at the abutments, adjacent to the spillway section and adjacent to the outlet works. Trespassing on the slopes was not significant. Erosion scarps on the upstream slope extending 1-2 feet above waterline were noted. Several areas of broad shallow erosion on the upstream slope and upstream side of abutments were observed. Brush and many large trees (up to 2.5-ft-dia.) with extensive root systems were noted on the slopes and crest of the dam.

b. Dam.

1) Upstream Slope - The upstream slope of the dam is covered with heavy brush and a number of trees. Several of these trees range up to 2.5 ft. in diameter and have extensive root systems growing into the embankment.

There is no riprap protection on the upstream slope and erosion scarps extending 1-2 ft. above the reservoir level have formed along much of the slope. Erosion has occurred at both abutments, at Sta 1+20 and adjacent to both sides of the spillway.

2) Crest - As shown in Photo No. 4, the crest of the dam is covered in various locations with grass, brush, a mat of fallen tree leaves, and bare soil. Erosion of the crest has occurred adjacent to the left side of the spillway (Photo No. 6), adjacent to the right side of the outlet gate (Photo No. 11), and at the left abutment. There is a tree growing on the upstream edge of the crest at the right side of the outlet gate, as shown in Photo No. 11.

3) Downstream Slope - The downstream slope is covered with brush and a number of trees, as shown in Photo No. 5. Several of these trees range up to 2 ft. in diameter with extensive root systems growing into the embankment. Photo No. 9 shows one of the large trees, located near the crest just to the right of the spillway.

Standing water was observed in an area about 35 ft. downstream from the toe at Sta 3+60, shown in Photo No. 10. This area is a local low spot, and the water may be runoff collected from surrounding areas.

c. Appurtenant Structures.

1) Spillway - The spillway section is located in the center of the embankment as shown in Photo No. 1. A dry stone masonry wall forms the downstream face of the dam in the spillway section, as shown in Photos No. 2, No. 3, No. 6 and No. 7. Water was overflowing the spillway at the time of inspection. All joints are open and unmortared (Photo No. 8). The spillway capstones are held together by metal plates/pins and appear to be in good condition.

The spillway training walls are stone masonry construction in generally fair condition with mortar missing from many of the joints as shown in Photos No. 6 and No. 7. There are two voids in the left training wall as shown in Photo No. 6. The largest void is approximately 3-ft-high by 1-ft-wide and extends about 5 ft. back into the crest. A small sapling is growing out of the face of the right training wall.

The banks of the spillway channel are lined with cut stone masonry for a distance of about 15-20 ft. downstream from the spillway crest, as shown in Photos No. 6 and No. 7. This cut stone masonry protects the downstream slope of the embankment adjacent to the spillway channel from erosion by water overflowing the spillway. As shown in Photo No. 6, the cut stone masonry on the left bank of the spillway channel may not extend far enough upslope to protect the slope during large water flow over the spillway.

2) Outlet Works - An outlet gate is located in the embankment to the left of the spillway, as shown in Photo No. 12. The outlet was flowing at the time of inspection. The outlet works consist of a concrete gate structure with two manually operated wooden sluicegates. The concrete and wood that was visible was in good condition, with minor concrete spalling noted.

d. Reservoir Area. The perimeter of the reservoir is moderate to steep sloping and wooded. There is no evidence of slides or slope failures. No sediment deposits were observed above the water level of the reservoir (see Photo No. 14).

e. Downstream Channel. The spillway channel is a natural stream 20 feet wide with 2:1 side slopes. The bed material consists of gravel and cobbles and appears stable (see Photo No. 13). There are a number of trees overhanging the channel, and one tree is growing in the floor of the channel.

The sides of the outlet channel (left of spillway) are lined with stone walls where the channel cuts through a portion of the embankment just downstream from the outlet gate. The wall on the left side of the channel appears to have bulged outward toward the channel.

There are a number of trees overhanging the downstream outlet channel.

3.2 EVALUATION:

Based on the visual inspection, the dam appears to be in poor condition. The inspection disclosed the following items which require attention:

a. The embankment is overgrown with heavy brush and many trees. Several of the trees are very large and have extensive root systems growing into the embankment. Uprooting of these trees by high winds and rotting of the root systems of trees that have died could provide pathways for seepage and lead to internal erosion (piping) of the embankment.

b. There is no riprap protection on the upstream slope, and, consequently, erosion scarps have formed on the slope at the waterline along much of the embankment.

c. Erosion has occurred on the upstream slope at both abutments, adjacent to both sides of the spillway, and at Sta 1+20. Erosion has occurred on the crest at the left abutment, adjacent to the left side of the spillway, and adjacent to the right side of the outlet gate.

d. Standing water was observed in an area about 35 ft. downstream from the toe at Sta 3+60.

e. There are two significant voids in the left spillway training wall and a sapling is growing out of the face of the right training wall.

f. The stone masonry wall on the left bank of the spillway channel just downstream from the spillway crest may not extend far enough upslope to protect the downstream slope of the embankment from erosion during a large flow over the spillway.

g. The stone wall on the left side of the outlet channel just downstream from the outlet gate appears to have bulged outward toward the channel.

h. There are a number of trees overhanging the downstream spillway channel and downstream outlet channel.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES:

a. General. The outlet works are not operated; therefore the water level is maintained principally by the spillway elevation. During the inspection, however, the gates were in a slightly open position. There are no standard operational procedures presently practiced at this dam.

b. Description of any Warning System in Effect. There is no warning system of any kind in effect at the dam.

4.2 MAINTENANCE PROCEDURES:

a. General. Maintenance of the dam appears to be completely lacking. Periodic growth removal from the embankment, repair of erosion on the crest and slopes, and surveillance relative to seeps has not been undertaken in several years.

b. Operating Facilities. There are no formal maintenance procedures followed for the operating facilities. However, the outlet works, concrete gate structure and wooden sluicegates appear to be of relatively new construction (less than 10 years old).

4.3 EVALUATION:

Regular operational maintenance for this dam and its appurtenances has not been developed or implemented.

An emergency action plan should be prepared to prevent or minimize the impact of failure. This plan should list the expedient actions to be taken and authorities to be contacted.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL DATA:

Upper Pond Dam is an earth embankment structure with a crest length of 318 feet and a height of 17 feet. The stone masonry spillway is located at the center of the dam and is 72 feet in length. (The total length of the dam is 390 feet.) The approach to the spillway is directly from the reservoir and is shallow in depth. The spillway functions as a broad crested weir with a vertical downstream face 12 feet in height. At a stage of 4 feet above the spillway a sag area in the crest located near the outlet works gate structure would begin to overtop. The outlet works consist of a concrete gate structure within the dam embankment located approximately 40 feet north (left) of the spillway. Two manual, gear operated wooden sluicegates pass water through the structure to the downstream outlet channel (headrace). The headrace, which historically transmitted water to a water powered factory, is approximately 20 feet in width and overgrown with trees and brush. The headrace which is approximately 500 feet in length is confined by a dike on the east (right) and natural ground to the west (left). Remains of the abandoned factory are located at the end of the headrace.

The watershed area is 6 square miles consisting of upland wooded terrain and valley agricultural land. The watershed is generally sparsely developed with some moderate development along the Candlewood Hill Brook valley area. Portions of the Cockaponset State Forest are located within the watershed. Future development is expected to take place at a slow to moderate pace.

There are no significant impoundments in the watershed. Scovill Reservoir, the largest upstream impoundment, has a minimal drainage area and provides little storage capacity. Candlewood Hill Brook does have a significant floodplain between Foot Hills Road and Upper Pond and is anticipated that it will provide considerable valley storage.

5.2 DESIGN DATA:

There is no design data available for this dam. In lieu of existing design information, U.S.G.S. Topographic Maps (scale 1" = 2000') were used to develop hydrologic parameters. Pertinent hydraulic design data was obtained by active field measurements at the time of inspection.

5.3 EXPERIENCE DATA:

There is no known experience data available for this dam.

5.4 TEST FLOOD ANALYSIS:

The Test Flood for determining spillway adequacy is based on Corps of Engineers guidelines. The size of the dam is "small" based on a storage volume of 180 acre feet and a height of 17 feet. The hazard classification is "high". Several occupied structures would experience about 2 feet of water above the first floor elevation, resulting in appreciable economic losses. Corps of Engineers guidelines for a "small" dam with "high" hazard gives a range for the selection of the Test Flood from a ½ PMF to PMF.

The Test Flood selected for this dam is the ½ PMF. This Test Flood was selected because the height and storage characteristics of the dam are on the low side of the range given. The magnitude of the Test Flood (½ PMF) was based on "Preliminary Guidance for Estimating PMF Discharges by the New England Division, Corps of Engineers," dated December 1977. The flood magnitude was based on the "rolling" watershed curve. The ½ PMF (Test Flood inflow) is 5400 CFS.

The Test Flood inflow was formed into a triangular hydrograph with a peak flow of 5400 CFS and a duration of 12 hours. The time to peak was set at one-third the total duration or 4 hours. The duration was selected so that the triangular hydrograph contains the same volume of water as the estimated storm runoff.

The developed hydropgrah was routed through the reservoir using a computer program based on stage-storage and stage-discharge data. The reservoir was assumed to be full and level with the spillway prior to the storm event. The sluicegates were assumed to be closed. The stage-discharge input data reflected the crest sag near the outlet works control structure. The results of the flood routing indicate that the spillway test flood outflow would be 5195 CFS at a maximum reservoir stage of 201.6 NGVD. The reduction of the Test Flood inflow of 5,400 CFS to an outflow of 5,195 CFS represents a reservoir attenuation of about 4 percent. This analysis indicates that the dam would be overtopped by a maximum depth of approximately 2.6 feet at the low point in the crest left (north) of the spillway and by approximately 0.9 feet right (south) of the spillway. The maximum duration of overtopping for this flood hydrograph is approximately 8 hours. It is noted that the maximum duration and depth of overtopping would occur at the lowpoint in the crest near the outlet works. At this location the earth embankment abuts the concrete outlet works control structure.

The spillway capacity without overtopping is 1730 CFS which is about 33 percent of the test flood outflow.

5.5 DAM FAILURE ANALYSIS:

The downstream impact of a dam failure was analyzed using the

Corps of Engineers "Rule of Thumb Guidance for Estimating Downstream Failure Hydrographs" dated April 1979.

Based on an assumed breach width, equal to 40 percent of the dam's width at mid-height, the total peak outflow due to a flood-wave from the dam would be 20,788 CFS. This includes an initial baseflow of 2415 CFS. The base flow was calculated with an assumed flow depth measured to the crest of the dam (El. 200.7 - right embankment).

The probable impact areas include several residential structures along Candlewood Hill Road and the Scovill Hoe Company. The flooding of two residential homes would be approximately 1 to 2 feet above the estimated first floor elevation. The Scovill Hoe Company would be the only structure that would have greater than 2 feet of water above the estimated first floor elevation. The river conditions just before assumed failure were to be determined at a stage of 4 to 5 feet above river bottom. Just after assumed failure the stage is 10 to 14 feet above river bottom.

Significant economic loss may occur to sections of Candlewood Hill Road should dam failure occur. With the possibility of the loss of more than a few lives and appreciable economic losses the dam has been classified as having a "high" hazard potential.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS:

The visual inspection did not disclose any immediate stability problems. Several items were noted that could affect the future long-term stability of the dam including:

a. Trees growing on the upstream or downstream faces of the dam.

b. Lack of upstream slope protection.

c. Possible seepage noted (approximately 35 ft. downstream from the toe at Sta. 3+60).

d. The locations where erosion is currently occurring and where it has occurred in the past should be restored to avoid potential future difficulties.

6.2 DESIGN AND CONSTRUCTION DATA:

There is insufficient design and construction data to permit a formal evaluation of stability.

6.3 OPERATING RECORDS:

No operating records pertinent to the structural stability of the dam are available.

6.4 POST-CONSTRUCTION CHANGES:

No information concerning post-construction changes is available.

6.5 SEISMIC STABILITY:

Upper Pond Dam is located in Seismic Zone 1 and, in accordance with the Phase I guidelines, do not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT:

a. Condition. Based on a visual inspection, the dam appears to be in poor condition. There are several features which could affect the long-term performance of the dam if they are not corrected as recommended in Sections 7.2 and 7.3.

b. Adequacy. The engineering information available was very limited and thus assessment of the condition of the dam was based primarily on the results of the visual inspection, past operational performance of the structure and sound engineering judgement.

c. Urgency. The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented by the owner within one year of receipt of this Phase I inspection report.

7.2 RECOMMENDATIONS:

The owner should retain a qualified registered engineer to accomplish the following:

a. Determine and implement procedures for removal of the trees growing on the upstream and downstream faces of the dam embankment and within 25 ft. of the downstream toe. The voids left in the embankment after removal of the tree root systems should be properly backfilled with suitable fill materials.

b. Conduct more refined hydrologic and hydraulic analysis to determine the need for and methods of increasing the project discharge capacity.

c. Design and install riprap slope protection for the upstream slope.

d. Additional slope protection should be designed and installed on the left bank of the spillway channel in the area immediately downstream from the spillway crest.

e. The rubble stone wall on the left side of the outlet channel just downstream from the outlet gate, which appears to have bulged toward the outlet channel, should be investigated, repaired and strengthened if necessary.

f. The crest of the dam in the vicinity of the outlet structure should be filled to restore proper grade.

g. Inspect spillway during period of low flow.

7.3 REMEDIAL MEASURES:

a. Operation and Maintenance Procedures. The owner should:

1) Clear brush from the dam embankment and from the area within 25 ft. of the downstream toe.

2) Plant grass where erosion has occurred and unprotected soil is exposed on the crest and downstream slope.

3) Inspect during dry weather the area where standing water was observed (approximately 35 ft. downstream from the toe at Sta 3+60) to determine whether seepage is occurring at that location.

4) The voids in the left spillway training wall should be repaired and the sapling growing out of the face of the right training wall should be cut and removed.

5) Institute a program of annual technical inspections.

6) Establish a surveillance program at the site during and immediately after heavy rainfall, and also a downstream warning program to follow in case of emergency conditions at the dam.

7.4 ALTERNATIVES:

There are no practical alternatives to the recommendations contained in Sections 7.2 and 7.3.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT UPPER POND DAM

DATE Nov. 6, 1979

TIME 0730

WEATHER Overcast, 50°

W.S. ELEV. ____ **U.S.** ____ **DN.S.**

PARTY:

1. R. Smith, FGA, Project Manager
2. P. Burgess, FGA, Hydraulics/Hydrology
3. R. Murdock, GEI, Geotechnical
4. D. Shields, GEI, Geotechnical
5.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	None observed.
Pavement Condition	No pavement.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Top of outlet gate structure is lower than embankment crest. Crest slopes downward toward outlet structure on both sides of outlet.
Horizontal Alignment	No misalignment observed.
Condition at Abutment and at Concrete Structures	Erosion at abutments, adjacent to spillway and adjacent to outlet works.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	Not significant.
Sloughing or Erosion of Slopes or Abutments	Erosion scarps on upstream slope extending 1-2 ft. above waterline. Several areas of broad shallow erosion on upstream slope and upstream side of abutments.
Rock Slope Protection - Riprap Failures	No riprap.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None.
Toe Drains	None.
Instrumentation System	None.
Vegetation	Brush and many trees on slopes. Some trees are large(up to 2.5 ft.in diameter)with extensive root systems.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
Crest Elevation	Not applicable.
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Stone masonry walls - fair condition.
Bottom Conditions	Not visable, underwater.
Rock Slides or Falls	None.
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	None - dry masonry construction.
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	Not applicable.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	Not applicable.
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	None.
Channel	Lined with rubble stone, masonry walls where channel cuts through downstream slope of embankment. Wall on left side appears to have bulged outward toward channel.
Loose Rock or Trees Overhanging Channel	Trees overhanging channel.
Condition of Discharge Channel	Good, except for bulged wall and overhanging trees as noted above.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov 6, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Not applicable.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	None.
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Trees overhanging channel.
Floor of Channel	Natural streambed. One tree growing in channel.
Other Obstructions	None.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: UPPER POND DAM DATE: Nov. 6, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
a. Superstructure	Not applicable.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat and Backwall	

APPENDIX B

ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Upper Pond Dam

I.D. NO. CT 00433

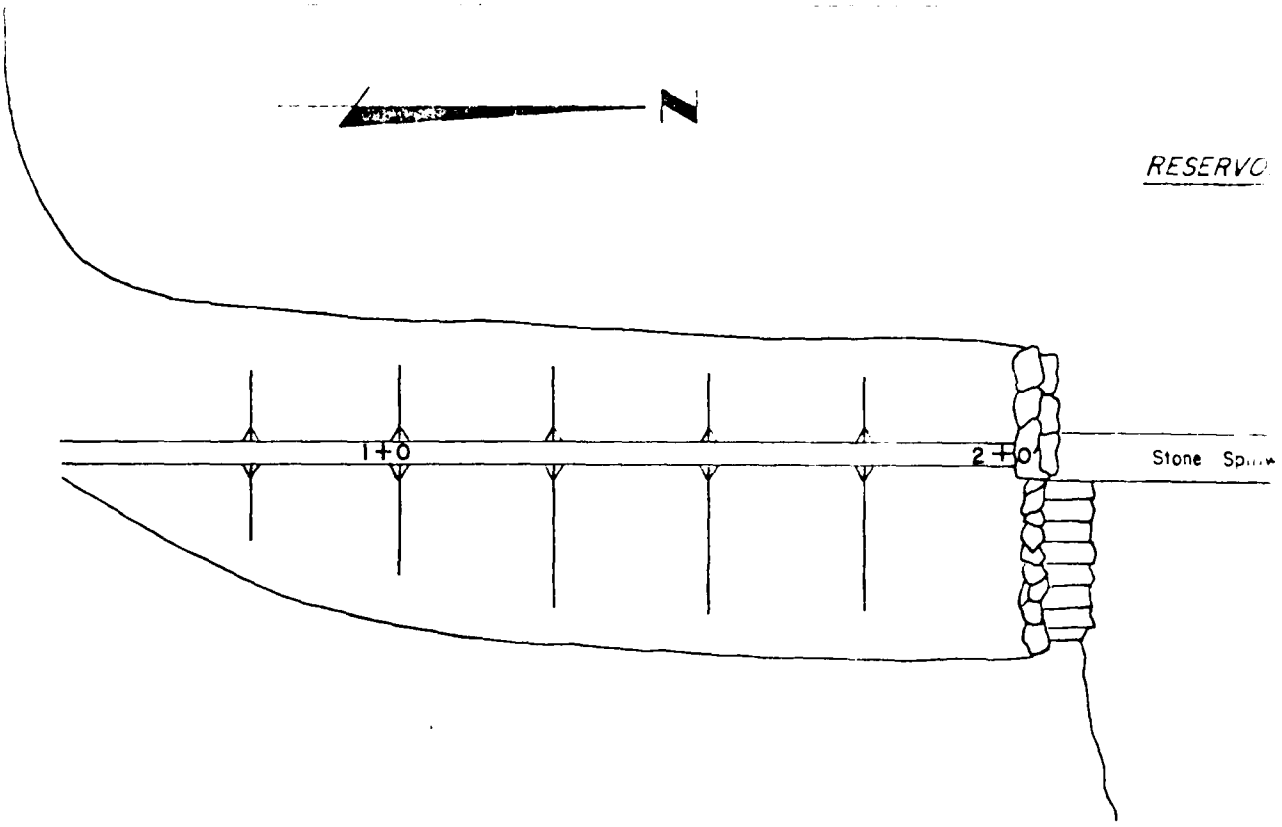
ITEM	REMARKS
AS-BUILT DRAWINGS	None available
REGIONAL VICINITY MAP	Available from U.S.G.S.
CONSTRUCTION HISTORY	None
TYPICAL SECTIONS OF DAM	Field measurements
OUTLETS - Plan	Field Measurements
- Details	Field Measurements
- Constraints	Unknown
- Discharge Ratings	None Available
RAINFALL/RESERVOIR RECORDS	Unavailable
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS	None
HYDROLOGY & HYDRAULICS	None
DAM STABILITY	None
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS	
BORINGS RECORDS	None
LABORATORY	None
FIELD	None

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

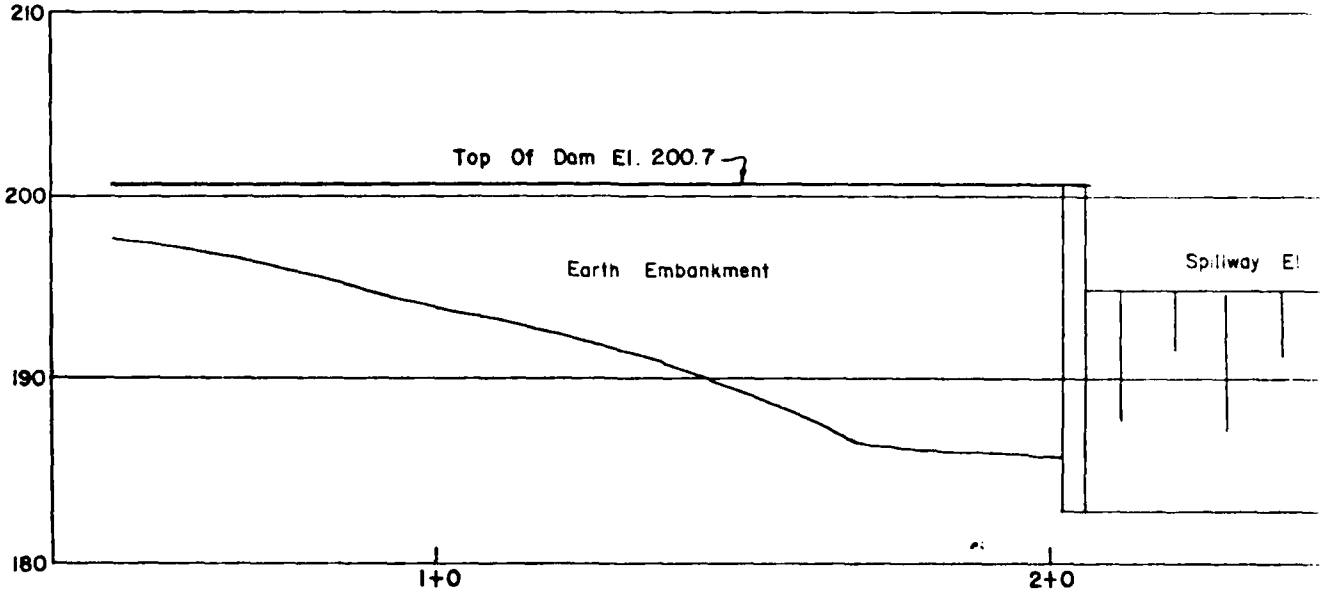
NAME OF DAM Upper Pond Dam

I.D. NO. CT 00433

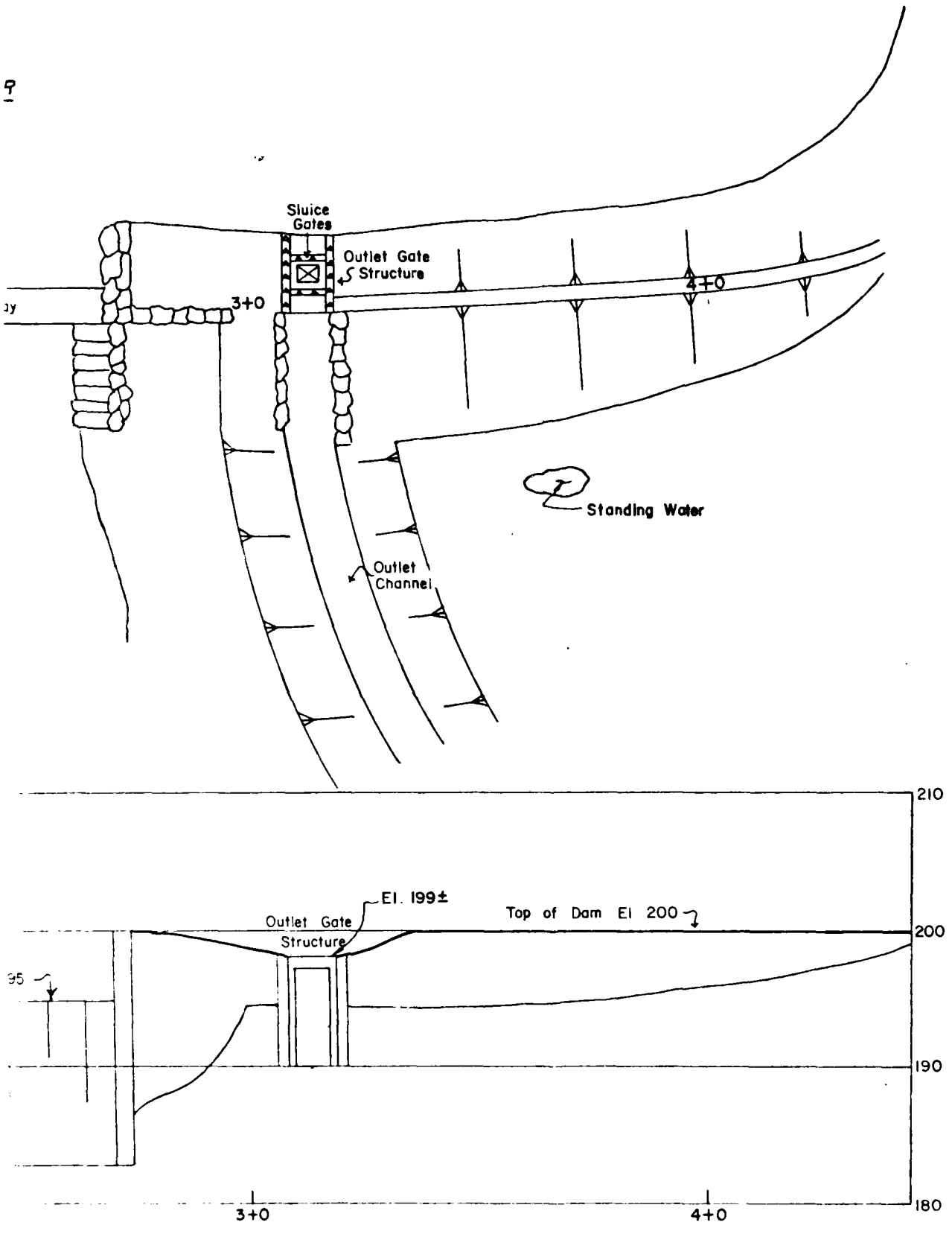
ITEM	REMARKS
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	Unknown
MONITORING SYSTEMS	Unknown
MODIFICATIONS	Unknown
HIGH POOL RECORDS	None
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown
MAINTENANCE OPERATION RECORDS	None available
SPILLWAY PLAN	
SECTIONS	Field measurements
DETAILS	Field measurements
OPERATING EQUIPMENT PLANS & DETAILS	Not available



PLAN
NTS



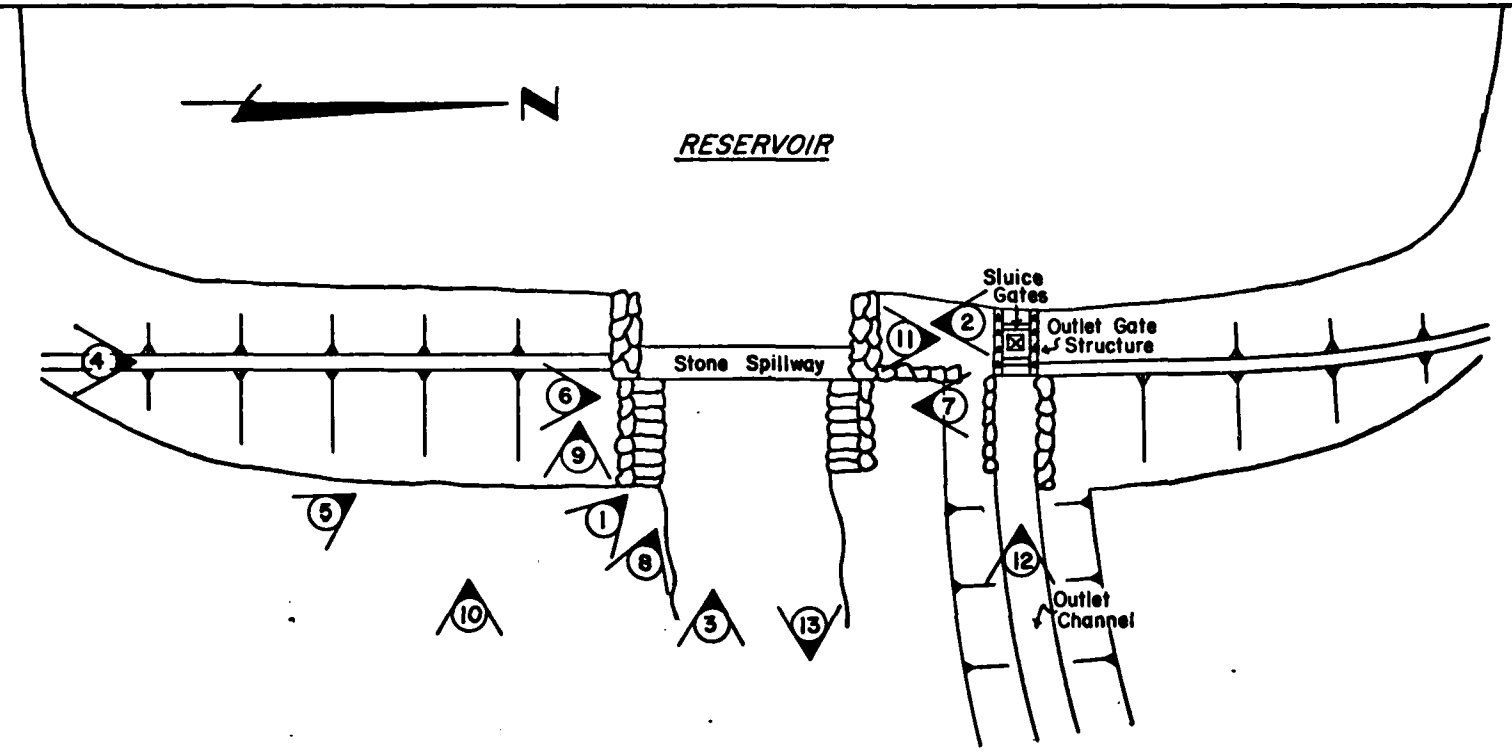
PROFILE
NTS



UPPER POND DAM

APPENDIX C

PHOTOGRAPHS



C-1

LEGEND

(5) Number refers to caption. Arrow indicates direction of photograph.

UPPER POND DAM

PHOTO LOCATION MAP

PHOTO #1: Spillway from right side of dam.

PHOTO #2: Crest of dam, looking toward right abutment.

PHOTO #3: Spillway and downstream channel.

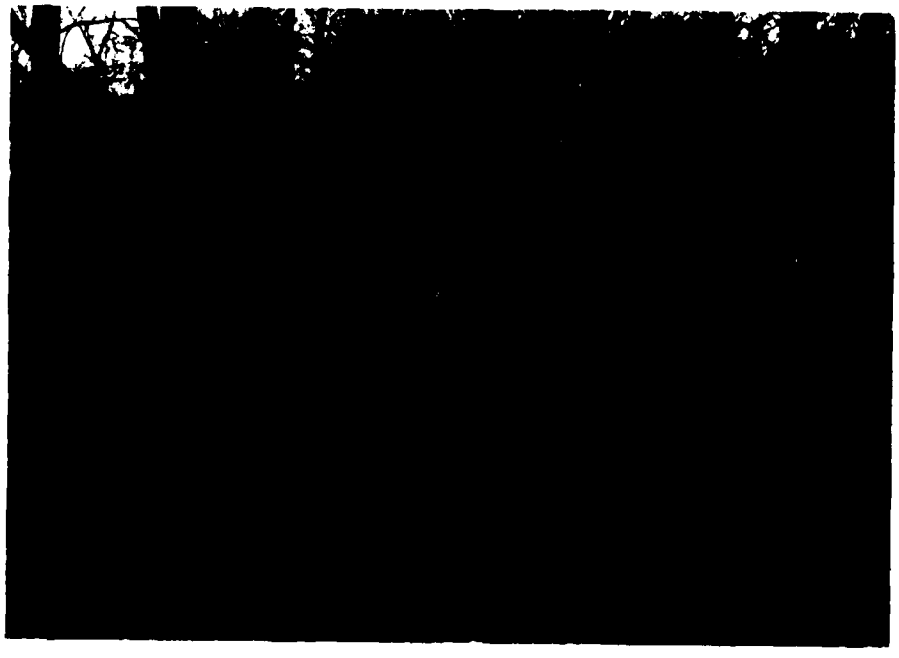


PHOTO #4: Crest of dam, looking toward left abutment.

PHOTO #5: Downstream slope, looking toward spillway from right side of dam.

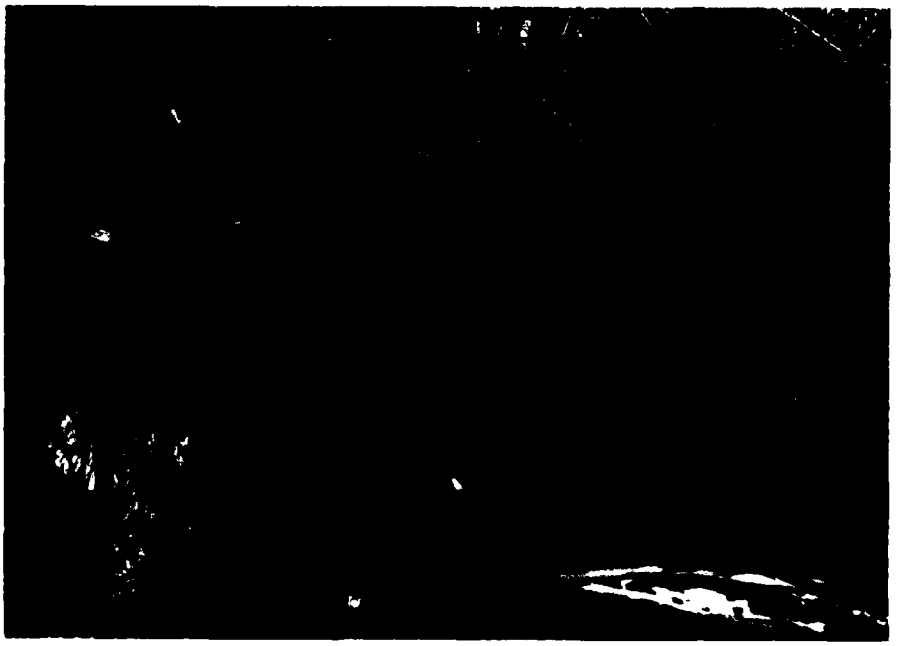


PHOTO #6: Spillway, looking toward left abutment.

PHOTO #7: Spillway, looking toward right side.

PHOTO #8: Spillway detail, rule extended 1 foot.

PHOTO #9: Tree near crest of dam.

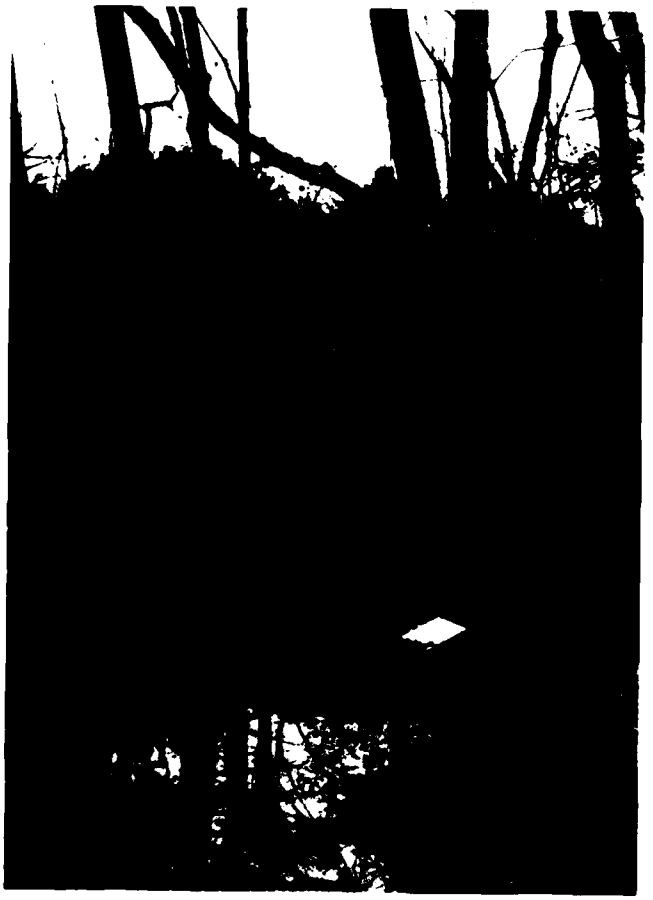


PHOTO #10: Wet area at toe of downstream slope, looking upslope.

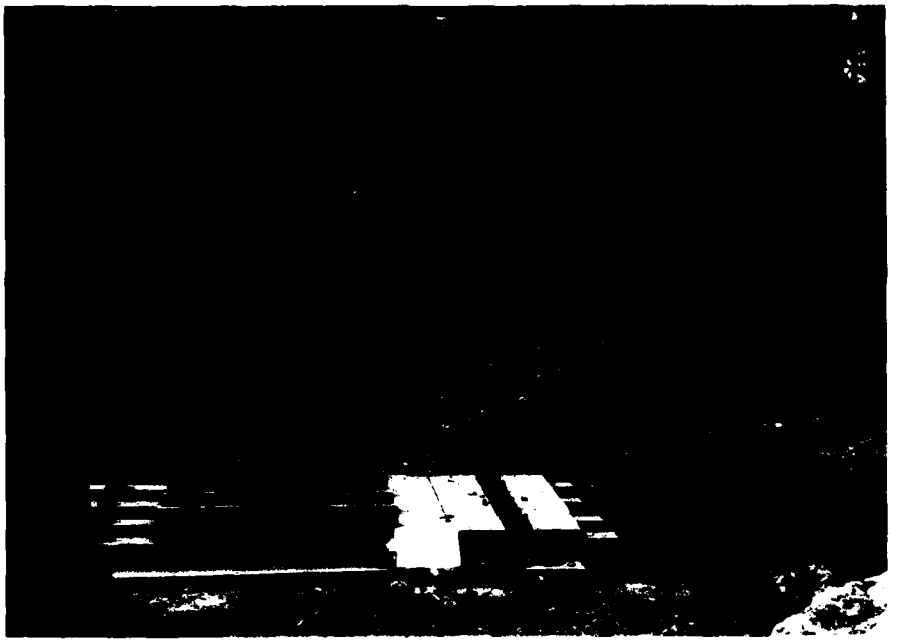


PHOTO #11: Crest of dam looking toward left abutment (top of outlet structure in foreground).

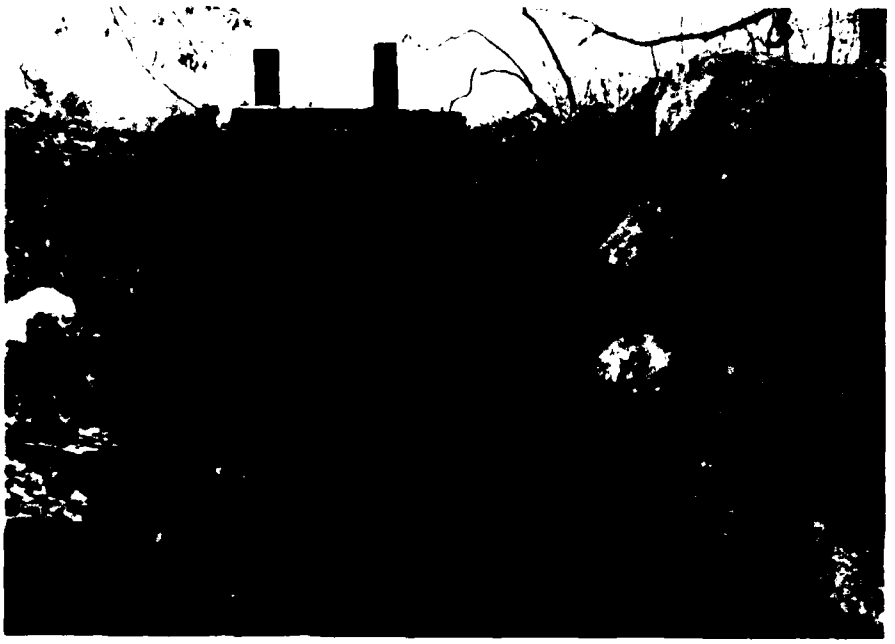


PHOTO #12: Outlet structure.

PHOTO #13: Downstream channel.

PHOTO #14: Reservoir area.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA NEW HAVEN, CONN 06510/203/789-1260

DETERMINATION OF SPILLWAY TEST FLOOD*

A. SIZE CLASSIFICATION

Storage Volume (Ac.-Ft.) 180

Height of Dam (Ft.) 17

Size Classification SMALL

B. HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life	Economic Loss
Low	None expected	Minimal
Significant	(Few)	(Appreciable)
High	More than few	Excessive

Hazard Classification SIGNIFICANT

C. HYDROLOGIC EVALUATION GUIDELINES

Hazard	Size	Spillway Test Flood
Low	Small	50 to 100-Year Frequency
	Intermediate	100-Year Frequency to 1/2 PMF
	Large	1/2 PMF to PMF
(Significant)	(Small)	100-Year Frequency to (1/2 PMF)
	Intermediate	1/2 PMF to PMF
	Large	PMF
High	Small	1/2 PMF to PMF
	Intermediate	PMF
	Large	PMF

Spillway Test Flood 1/2 PMF

*Based upon "Recommended Guidelines for Safety Inspection of Dams" Department of the Army, Office of the Chief of Engineers, November 1976.

PROJECT 799010
U. PER POND DAM
HADDAM CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 2 OF
BY RAC DATE 3-4-80
CHK'D. BY PB DATE 3-13-80

DETERMINATION OF THE

MAXIMUM PROBABLE FLOOD (MPF)

A. Drainage Area in Square Miles 6.0

B. Watershed Characteristic: Flat & Coastal

(Rolling)

Moutainous

C. M.P.F. in CFS/Square Mile,* 1800

M.P.F. = (CFS/Square Mile) x (Area in Square Miles)

1800 x 6.0 = 10,800

1/2 PMF = 5400 CFS

*Based upon the figure "Maximum Probable Flood Peak Flow Rates" U.S. Army Corps of Engineers, December 1977.

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

THE PMP RAINFALL IS 24 INCHES FOR A 6 HOUR DURATION STORM. ∴ USING A 20% FACTOR FOR IMPERFECT FIT, THE EFFECTIVE RAINFALL IS 19.2 INCHES (SEE FIG 15, DESIGN OF SMALL DAMS.

VOLUME OF RUNOFF

BASED ON AN ASSUMED CN VALUE OF 80 (FOR GLACIAL TILL SOILS), RUNOFF FOR THE PMP IS 16.5 INCHES (FIG A-4, DESIGN OF SMALL DAMS)

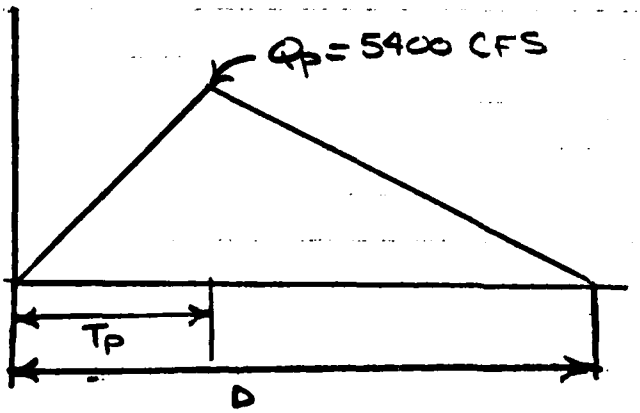
SPILLWAY TEST FLOOD RUNOFF = $\frac{1}{2}(16.5) = 8.25''$

VOLUME OF RUNOFF

$$\left(\frac{8.25''}{12''/FT}\right)\left(6.0\ MI^2\right)\left(\frac{640\ AC}{MI^2}\right) = 2640\ AC\text{-}FT$$

TEST FLOOD HYDROGRAPH

A TRIANGULAR HYDROGRAPH IS TO BE USED FOR THE ROUTING OF THE TEST FLOOD THROUGH THE RESERVOIR, PEAK FLOW EQUALS 5400 CFS, SET DURATION OF RUNOFF SO AS TO CONTAIN VOLUMN OF RUNOFF, AND RECEEDING LIMB EQUALS TWICE THE RISING LIMB.



FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

HYDROGRAPH $VOL = \frac{1}{2} Q_p D$

$$D = \frac{(2640 \text{ AC-FT})(43560 \text{ FT}^3/\text{AC-FT})}{(.5)(5400 \text{ CFS})(60 \text{ S/M})(60 \text{ M/HR})} = 11.8 \text{ HRS}$$

SAY 12.0

D = 12.0 HOURS Tp = 4.0 HOURS

HYDROGRAPH FORMATION

D = 12.0 HOURS Tp = 4.0 HOURS
Qp = 5400

TIME (HOURS)	INFLOW (CFS)
0	0
1	1350
2	2700
3	4050
4	5400
5	4725
6	4050
7	3375
8	2700
9	2025
10	1350
11	675
12	0

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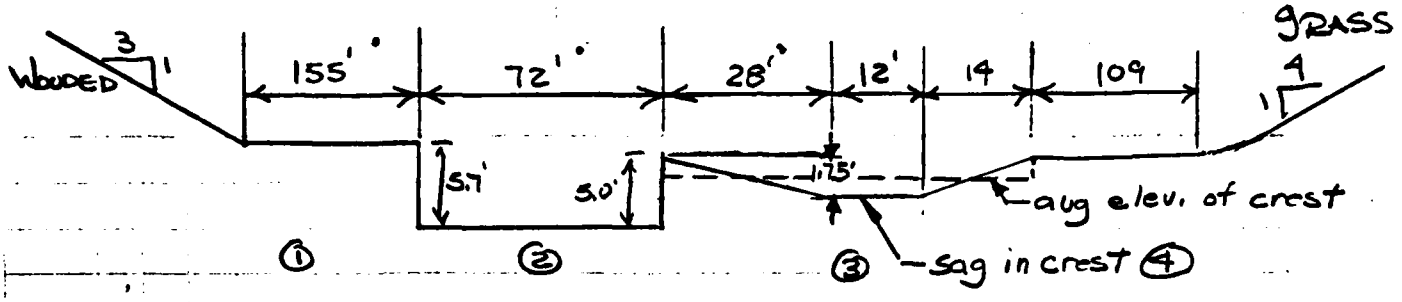
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 5 OF
BY RAC DATE 3-5-80
CHK'D. BY PB DATE 3-19-80

SPILLWAY AND OVERFLOW SECTION DATA

N.T.S.



SEGMENT	ITEM	"C"	LENGTH	ELEV. (USGS)
1	EARTH EMBANKMENT	2.5	155'	200.7'
2	STONE SPILLWAY	3.0	72'	195.0'
3	EARTH EMBANKMENT (SAG)	2.5	54	199.0
4	EARTH EMBANKMENT	2.5	109	200.0

IE = 195
IV = 0
E = 195 A = 10.10
E = 200 A = 26.60
E = 210 A = 55.10

ASSUMED BREACH WIDTH = 156'

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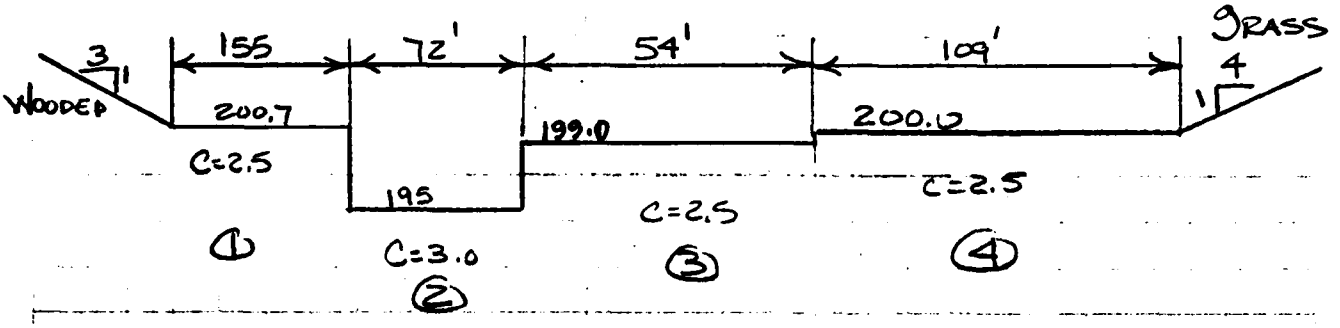
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

STAGE DISCHARGE DATA



ELEV	196	197	198	199	200	201	202
$Q_1 = C_1 L_1 H^{3/2}$ $Q_1 = (2.5)(155) H^{3/2}$						64	574
$Q_2 = C_2 L_2 H^{3/2}$ $Q_2 = (3.0)(72) H^{3/2}$	216	611	1122	1728	2415	3175	4000
$Q_3 = C_3 L_3 H^{3/2}$ $Q_3 = (2.5)(54) H^{3/2}$					115	354	667
$Q_4 = C_4 L_4 H^{3/2}$ $Q_4 = (2.5)(109) H^{3/2}$						273	771
TOTAL CAPACITY	216	611	1122	1728	2530	3866	6012

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ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

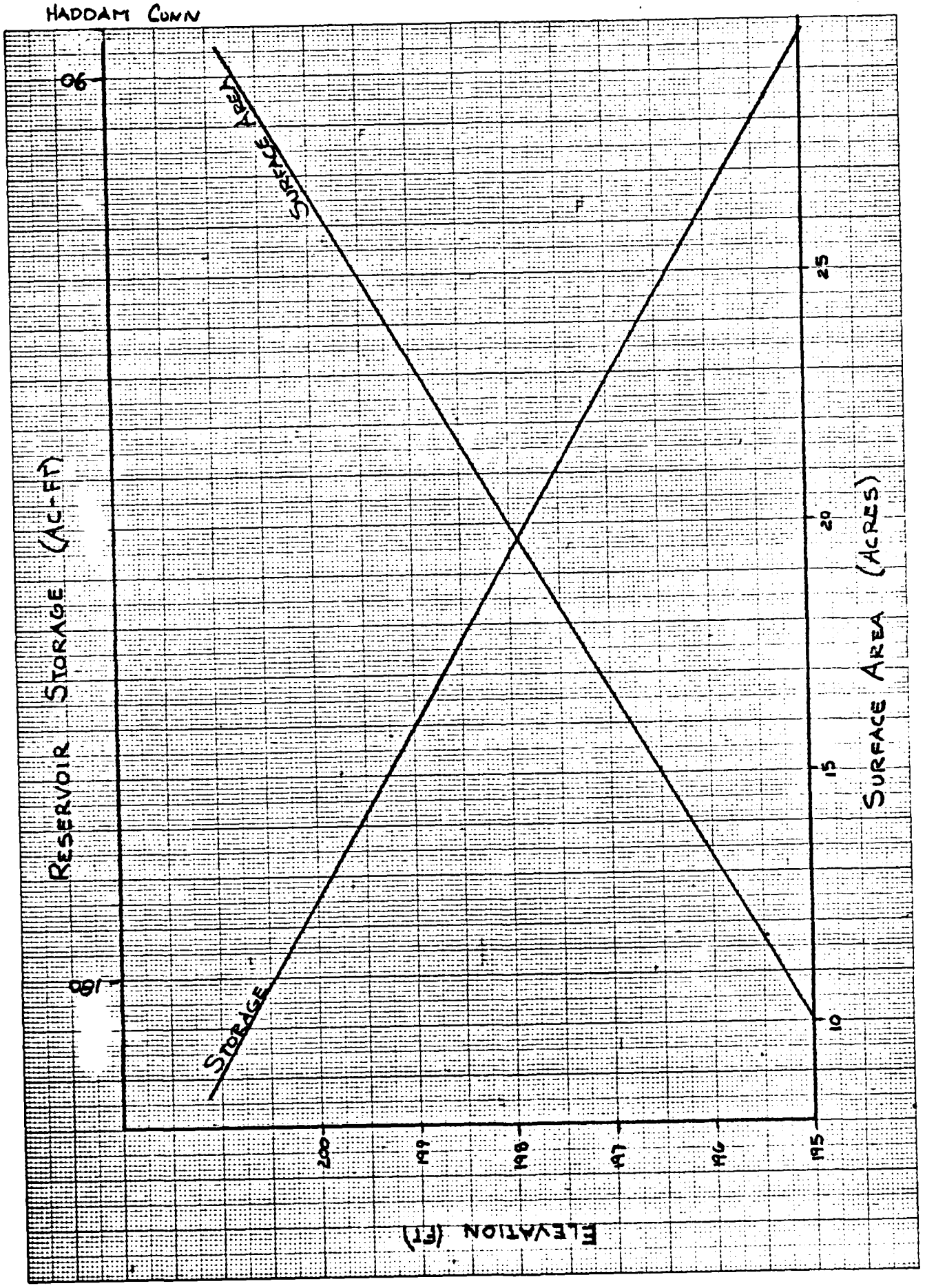
SHEET NO. 7 OF
BY RAC DATE 3-24-80
CHK'D. BY DB DATE 4-3-80

HSE #	BASE FLOW ELEVATION	FLOODWAVE ELEVATION	FIRST FLOOR ELEVATION	WATER DEPTH	
				BASE FLOW	FLOODWAVE
1	188.5	192.7	192	—	0.7
2	177.6	182.4	182	—	0.4
3	150.6	153.4	152	—	1.4
4	149.3	152.0	151	—	1.0
5	145.3	147.7	145	0.3	2.7

WATER DEPTH	# HOUSES
0-1	3
1-2	1
2-3	1

799010
UPPER POND DAM
HADDAM CONN

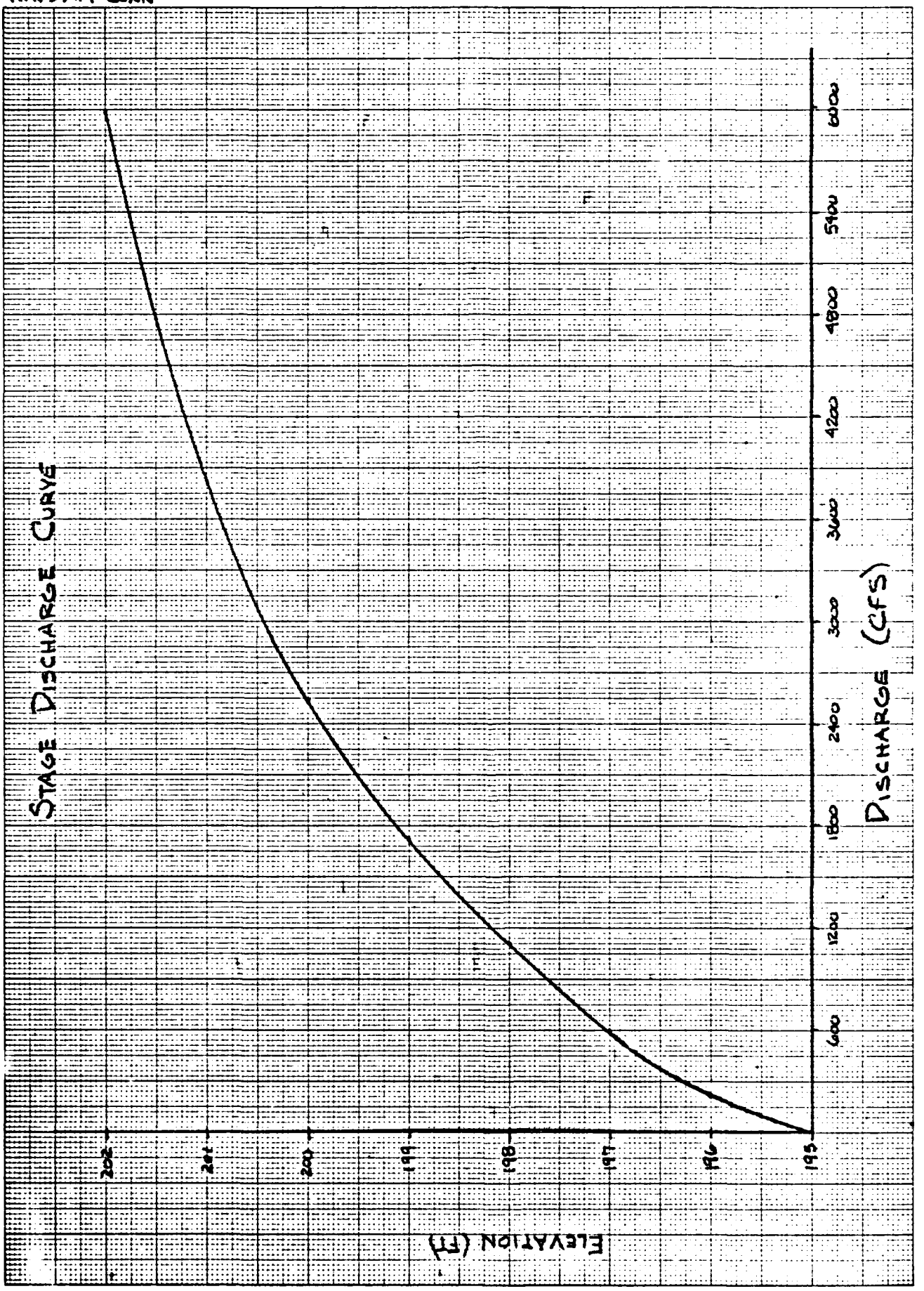
RAC 3-24-80
PB 4-3-80



D-8

79 90 10
UPPER POND
HADDAM CONN

RAC 3-24-80
PB 4-3-80



FGA FLOOD WAVE ROUTING

APPROXIMATE FLOOD WAVE ROUTING BASED UPON U.S. ARMY CORPS OF ENGINEERS' "RULE OF THUMB GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS" DATED APRIL, 1978.

INITIAL STATION = 0 +0
INITIAL BASE FLOW = 2,415 CFS
INITIAL WAVE HEIGHT = 17.0 FT
ASSUMED BREACH WIDTH = 156.0 FT
INITIAL RESERVOIR STORAGE = 180 ACRE-FT
COMPUTED FLOOD WAVE PEAK FLOW = 18,373 CFS
TOTAL FLOOD WAVE PEAK FLOW = 20,788CFS

STATION 0+70

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-410.0 FT	250.0 FT	-230.0 FT	220.0 FT	-160.0 FT	200.0 FT
-10.0 FT	193.0 FT				
		N = 0.040			
-10.0 FT	193.0 FT	-5.0 FT	190.0 FT	5.0 FT	190.0 FT
10.0 FT	193.0 FT				
		N = 0.080			
10.0 FT	193.0 FT	100.0 FT	200.0 FT	290.0 FT	210.0 FT
430.0 FT	220.0 FT	640.0 FT	230.0 FT	970.0 FT	240.0 FT

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
443.6 SF	138.0 FT	0.080	15.2 FPS	6,785CFS
173.6 SF	21.6 FT	0.040	56.2 FPS	9,775CFS
266.1 SF	82.9 FT	0.080	15.2 FPS	4,066CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
190.0 FT	9.4 FT	199.4 FT	883 SF	23.3 FPS	20,627 CFS	0.1430

BASE FLOW = 2,415 CFS BASE STAGE = 194.3 FT.

STATION 3 +0

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-250.0 FT	220.0 FT	-150.0 FT	200.0 FT	-90.0 FT	190.0 FT
-10.0 FT	190.0 FT				
		N = 0.040			
-10.0 FT	190.0 FT	-5.0 FT	187.0 FT	5.0 FT	187.0 FT
10.0 FT	190.0 FT				
		N = 0.080			
10.0 FT	190.0 FT	200.0 FT	190.0 FT	700.0 FT	200.0 FT
900.0 FT	210.0 FT	1000.0 FT	220.0 FT		

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
615.6 SF	117.9 FT	0.080	6.3 FPS	3,923CFS
169.7 SF	21.6 FT	0.040	16.7 FPS	2,836CFS
2,157.5 SF	501.9 FT	0.080	5.5 FPS	12,080CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
187.0 FT	9.2 FT	196.2 FT	2,942 SF	6.4 FPS	18,840 CFS	0.0130

BASE FLOW = 2,415 CFS BASE STAGE = 191.7 FT.

STATION 4+70

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-560.0 FT	250.0 FT	-200.0 FT	200.0 FT	-100.0 FT	190.0 FT
-10.0 FT	190.0 FT				
		N = 0.040			
-10.0 FT	190.0 FT	-5.0 FT	186.0 FT	5.0 FT	186.0 FT
10.0 FT	190.0 FT				
		N = 0.080			
10.0 FT	190.0 FT	100.0 FT	190.0 FT	500.0 FT	190.0 FT
520.0 FT	200.0 FT	730.0 FT	250.0 FT		

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
673.0 SF	147.1 FT	0.080	3.9 FPS	2,646CFS
173.6 SF	22.8 FT	0.040	11.0 FPS	1,918CFS
2,817.2 SF	502.7 FT	0.080	4.5 FPS	12,681CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
186.0 FT	9.6 FT	195.6 FT	3,663 SF	4.7 FPS	17,246 CFS	0.0059

BASE FLOW = 2,415 CFS BASE STAGE = 191.5 FT.

STATION 7+70

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-175.0 FT	220.0 FT	-100.0 FT	200.0 FT	-25.0 FT	190.0 FT
-10.0 FT	180.0 FT				
		N = 0.040			
-10.0 FT	180.0 FT	-5.0 FT	177.0 FT	5.0 FT	177.0 FT
10.0 FT	180.0 FT				
		N = 0.080			
10.0 FT	180.0 FT	625.0 FT	190.0 FT	650.0 FT	200.0 FT
750.0 FT	220.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
36.1 SF	12.5 FT	0.080	6.5 FPS	235CFS
183.8 SF	21.6 FT	0.040	26.7 FPS	4,922CFS
1,482.4 SF	427.0 FT	0.080	7.3 FPS	10,934CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
177.0 FT	9.9 FT	186.9 FT	1,702 SF	9.4 FPS	16,093 CFS	0.0300

BASE FLOW = 2,415 CFS BASE STAGE = 182.5 FT.

STATION 11 +0

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-400.0 FT	250.0 FT	-175.0 FT	200.0 FT	-150.0 FT	190.0 FT
-25.0 FT	180.0 FT	-10.0 FT	179.0 FT		
		N = 0.040			
-10.0 FT	179.0 FT	-5.0 FT	176.0 FT	5.0 FT	176.0 FT
10.0 FT	179.0 FT				
		N = 0.050			
10.0 FT	179.0 FT	100.0 FT	180.0 FT		
		N = 0.040			
100.0 FT	180.0 FT	150.0 FT	190.0 FT	400.0 FT	190.0 FT
		N = 0.050			
400.0 FT	190.0 FT	500.0 FT	200.0 FT	600.0 FT	210.0 FT
750.0 FT	220.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
832.4 SF	141.3 FT	0.080	3.3 FPS	2,761CFS
272.1 SF	21.6 FT	0.040	10.9 FPS	2,992CFS
977.0 SF	90.0 FT	0.050	7.9 FPS	7,797CFS
356.7 SF	300.9 FT	0.040	2.2 FPS	813CFS
0.6 SF	3.5 FT	0.050	0.5 FPS	0CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
176.0 FT	14.3 FT	190.3 FT	2,439 SF	5.8 FPS	14,364 CFS	0.0030

BASE FLOW = 2,415 CFS BASE STAGE = 183.1 FT.

STATION 16+80

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-710.0 FT	250.0 FT	-290.0 FT	200.0 FT	-220.0 FT	190.0 FT
-30.0 FT	180.0 FT	-10.0 FT	177.0 FT		
		N = 0.040			
-10.0 FT	177.0 FT	-5.0 FT	174.0 FT	5.0 FT	174.0 FT
10.0 FT	177.0 FT				
		N = 0.050			
10.0 FT	177.0 FT	90.0 FT	180.0 FT	200.0 FT	190.0 FT
450.0 FT	200.0 FT	700.0 FT	220.0 FT	810.0 FT	250.0 FT

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
708.7 SF	162.2 FT	0.050	4.6 FPS	3,282CFS
254.3 SF	21.6 FT	0.040	11.1 FPS	2,845CFS
1,023.7 SF	162.5 FT	0.050	5.9 FPS	6,051CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
174.0 FT	13.4 FT	187.4 FT	1,986 SF	6.1 FPS	12,179 CFS	0.0034

BASE FLOW = 2,415 CFS BASE STAGE = 181.9 FT.

STATION 25+80

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-400.0 FT	250.0 FT	-140.0 FT	200.0 FT	-50.0 FT	170.0 FT
-10.0 FT	170.0 FT				
		N = 0.040			
-10.0 FT	170.0 FT	-5.0 FT	167.0 FT	5.0 FT	167.0 FT
10.0 FT	170.0 FT				
		N = 0.050			
10.0 FT	170.0 FT	130.0 FT	170.0 FT	210.0 FT	200.0 FT
400.0 FT	230.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
303.8 SF	59.5 FT	0.080	4.8 FPS	1,477CFS
168.3 SF	21.6 FT	0.040	12.8 FPS	2,167CFS
790.9 SF	137.5 FT	0.050	8.4 FPS	6,662CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
167.0 FT	9.1 FT	176.1 FT	1,263 SF	8.1 FPS	10,308 CFS	0.0078

BASE FLOW = 2,415 CFS BASE STAGE = 172.3 FT.

STATION 32+30

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-510.0 FT	200.0 FT	-280.0 FT	170.0 FT	-190.0 FT	160.0 FT
-60.0 FT	150.0 FT	-10.0 FT	150.0 FT		
		N = 0.040			
-10.0 FT	150.0 FT	-5.0 FT	147.0 FT	5.0 FT	147.0 FT
10.0 FT	150.0 FT				
		N = 0.050			
10.0 FT	150.0 FT	40.0 FT	150.0 FT	170.0 FT	160.0 FT
270.0 FT	170.0 FT	400.0 FT	200.0 FT	730.0 FT	200.0 FT

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
394.2 SF	113.1 FT	0.080	7.4 FPS	2,954CFS
141.7 SF	21.6 FT	0.040	22.8 FPS	3,235CFS
297.4 SF	93.1 FT	0.050	11.3 FPS	3,365CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
147.0 FT	7.8 FT	154.8 FT	833 SF	11.4 FPS	9,555 CFS	0.0308

BASE FLOW = 2,415 CFS BASE STAGE = 151.9 FT.

STATION 40 +0

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-1270.0 FT	180.0 FT	-470.0 FT	150.0 FT	-200.0 FT	140.0 FT
-80.0 FT	140.0 FT	-10.0 FT	140.0 FT		
		N = 0.040			
-10.0 FT	140.0 FT	-5.0 FT	137.0 FT	5.0 FT	137.0 FT
10.0 FT	140.0 FT				
		N = 0.080			
10.0 FT	140.0 FT	100.0 FT	140.0 FT	130.0 FT	150.0 FT
380.0 FT	170.0 FT	700.0 FT	180.0 FT		

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
962.1 SF	296.8 FT	0.080	4.6 FPS	4,462CFS
124.0 SF	21.6 FT	0.040	13.5 FPS	1,682CFS
379.2 SF	102.5 FT	0.080	5.0 FPS	1,921CFS

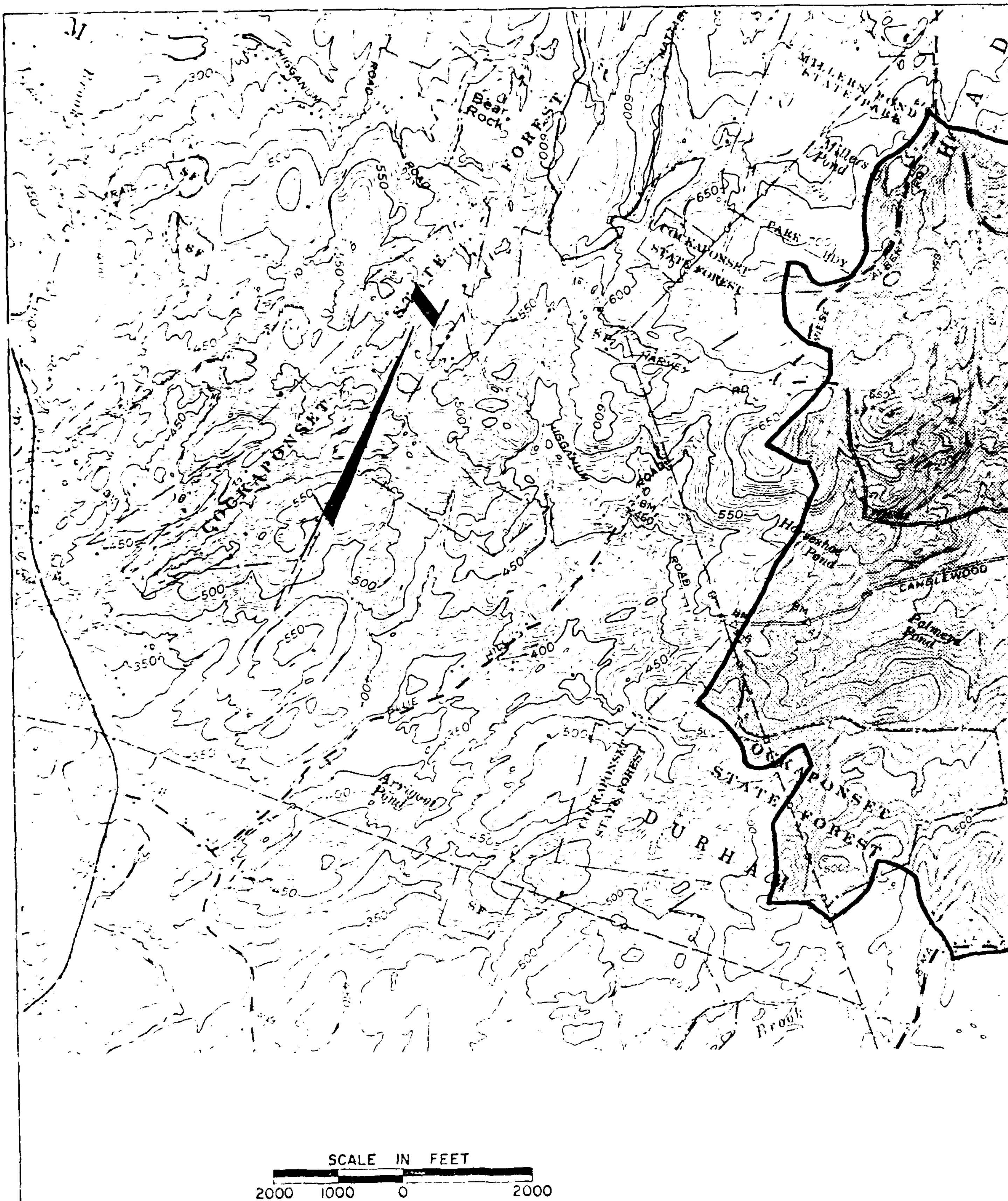
INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
137.0 FT	6.9 FT	143.9 FT	1,465 SF	5.5 FPS	8,066 CFS	0.0130

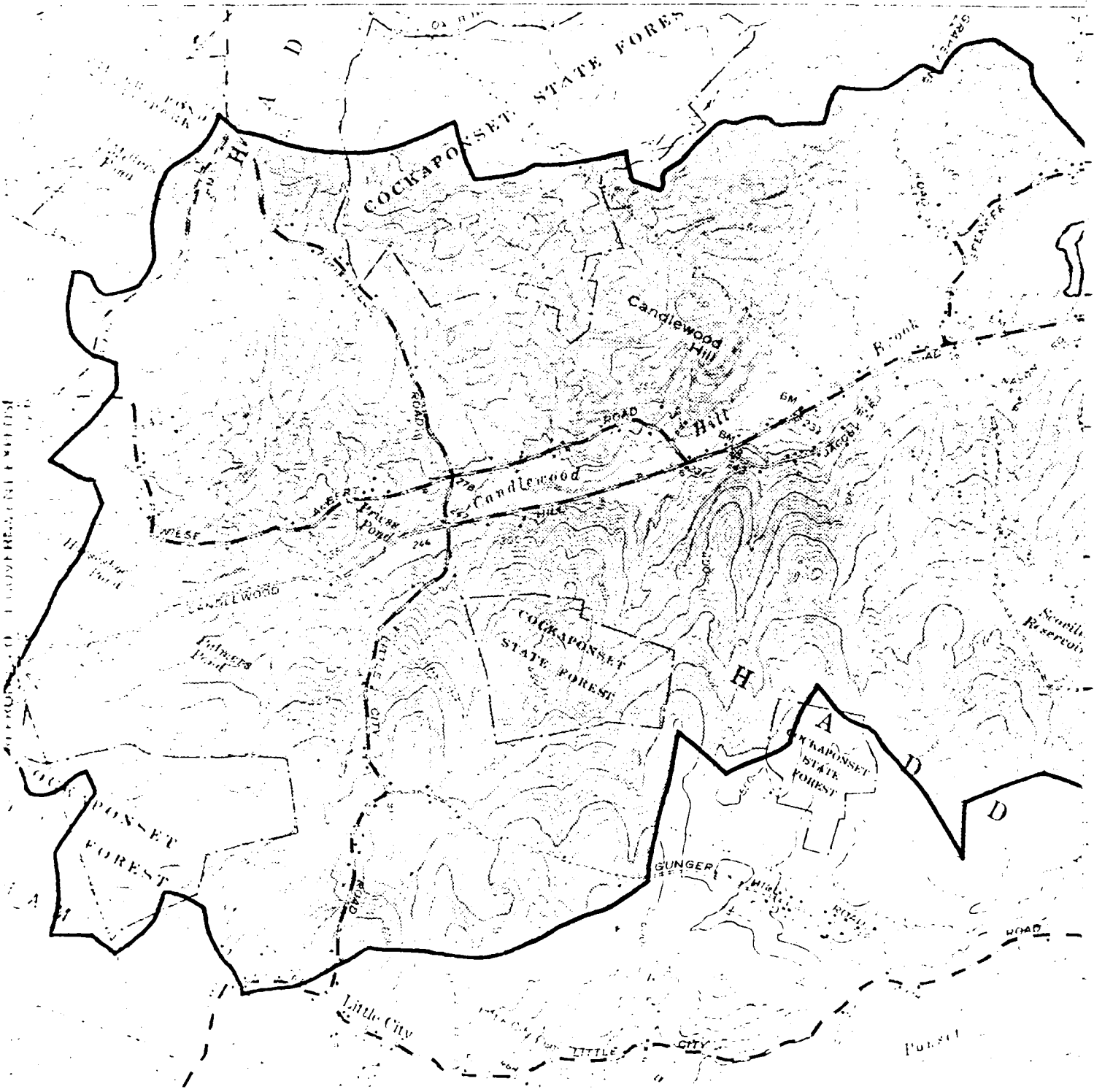
BASE FLOW = 2,415 CFS BASE STAGE = 141.7 FT.

UPPER POND DAM 799010 FLOOD ROUTING RAC MARCH 24, 1980
CK DB 4-3-80

INPUT DATA: UNSUBMERGED WEIR
SEGMENT 1 DISCHARGE COEFFICIENT = 2.5 LENGTH OF WEIR = 155 ELEVATION OF WEIR = 200.7
SEGMENT 2 DISCHARGE COEFFICIENT = 3 LENGTH OF WEIR = 72 ELEVATION OF WEIR = 195
SEGMENT 3 DISCHARGE COEFFICIENT = 2.5 LENGTH OF WEIR = 54 ELEVATION OF WEIR = 199
SEGMENT 4 DISCHARGE COEFFICIENT = 2.5 LENGTH OF WEIR = 109 ELEVATION OF WEIR = 200
IE=195.0 IV= 0.0 E=195.0 A= 10.10 E=200.0 A= 26.60 E=210.0 A= 55.10

HOUR	INFLOW	MASS INFLOW	WATER EL.	TAIL WATER	OUTFLOW	MASS OUTFLOW	STORAGE(R)	STORAGE(A)
0.00	0CFS	0.00AC-F	195.00FT	.00FT	0CFS	0.00AC-F	0.00AC-F	0.00AC-F
1.00	1,350CFS	55.78AC-F	197.10FT	0.00FT	659CFS	27.23AC-F	28.55AC-F	28.55AC-F
2.00	2,700CFS	223.14AC-F	199.54FT	0.00FT	2,146CFS	143.17AC-F	79.96AC-F	79.96AC-F
3.00	4,050CFS	502.06AC-F	200.89FT	0.00FT	3,712CFS	385.28AC-F	116.77AC-F	116.77AC-F
4.00	5,400CFS	892.56AC-F	201.63FT	0.00FT	5,196CFS	753.41AC-F	139.14AC-F	139.14AC-F
5.00	4,725CFS	1,310.95AC-F	201.54FT	0.00FT	4,996CFS	1,174.59AC-F	136.35AC-F	136.35AC-F
6.00	4,050CFS	1,673.55AC-F	201.11FT	0.00FT	4,099CFS	1,550.47AC-F	123.08AC-F	123.08AC-F
7.00	3,375CFS	1,980.37AC-F	200.79FT	0.00FT	3,547CFS	1,866.47AC-F	113.89AC-F	113.89AC-F
8.00	2,700CFS	2,231.40AC-F	200.29FT	0.00FT	2,871CFS	2,131.74AC-F	99.66AC-F	99.65AC-F
9.00	2,025CFS	2,426.65AC-F	199.66FT	0.00FT	2,253CFS	2,343.52AC-F	83.13AC-F	83.13AC-F
10.00	1,350CFS	2,566.11AC-F	198.82FT	0.00FT	1,615CFS	2,503.36AC-F	62.74AC-F	62.74AC-F
11.00	675CFS	2,649.79AC-F	197.71FT	0.00FT	968CFS	2,610.13AC-F	39.66AC-F	39.66AC-F
12.00	0CFS	2,677.68AC-F	196.24FT	0.00FT	300CFS	2,662.55AC-F	15.13AC-F	15.13AC-F


Bear Rock
COCKAPONSET STATE FOREST
MILLERS POND STATE PARK
Millers Pond
COCKAPONSET STATE FOREST
HARVEY
Horseshoe Pond
CAMBLEWOOD
Palmers Pond
Arrigoni Pond
COCKAPONSET STATE FOREST
DURHAM
Brook
SCALE IN FEET
2000 1000 0 2000

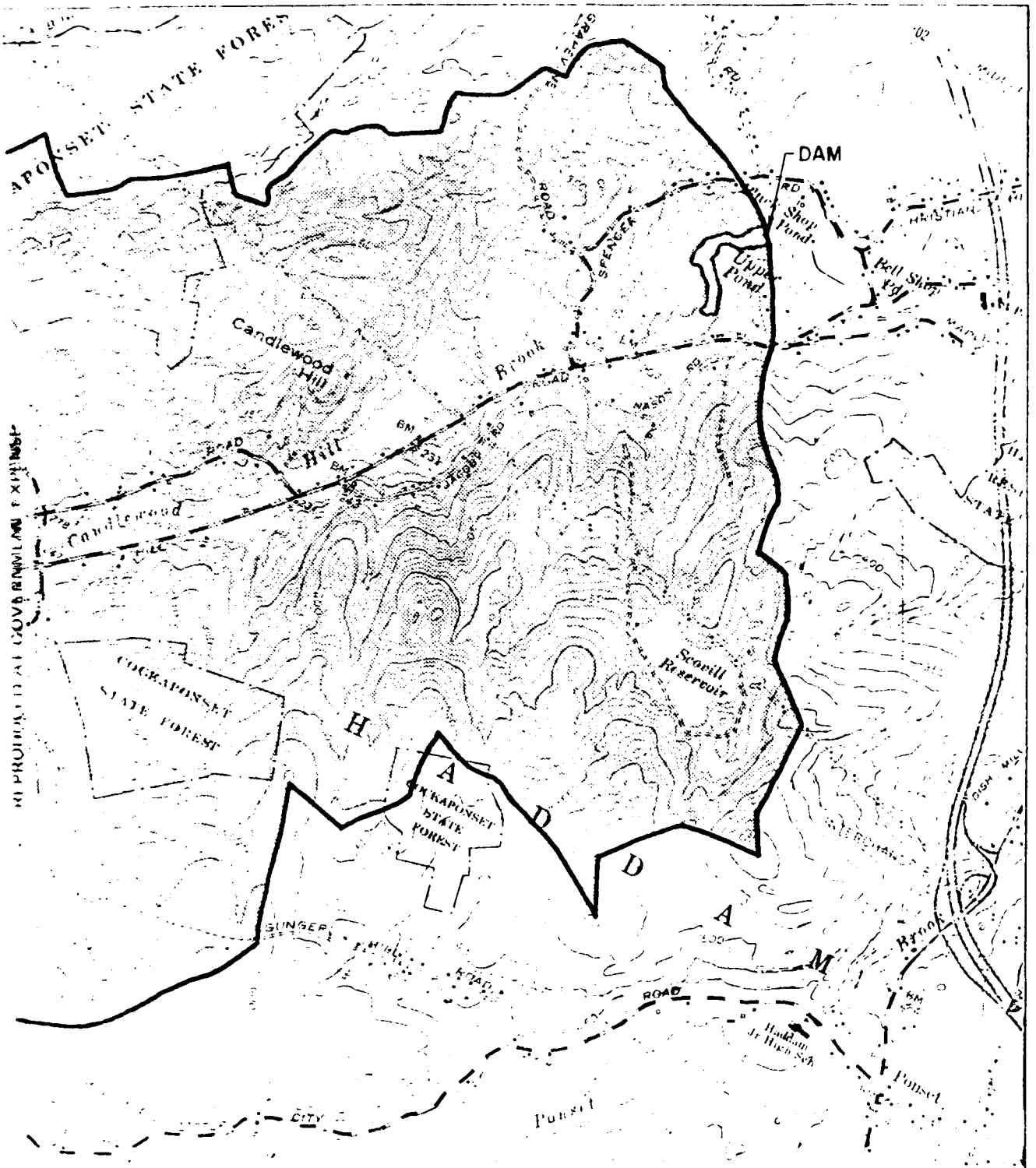


UPPER POND DAM

DRAINAGE MAP

HADDAM , CONNECTICUT

2

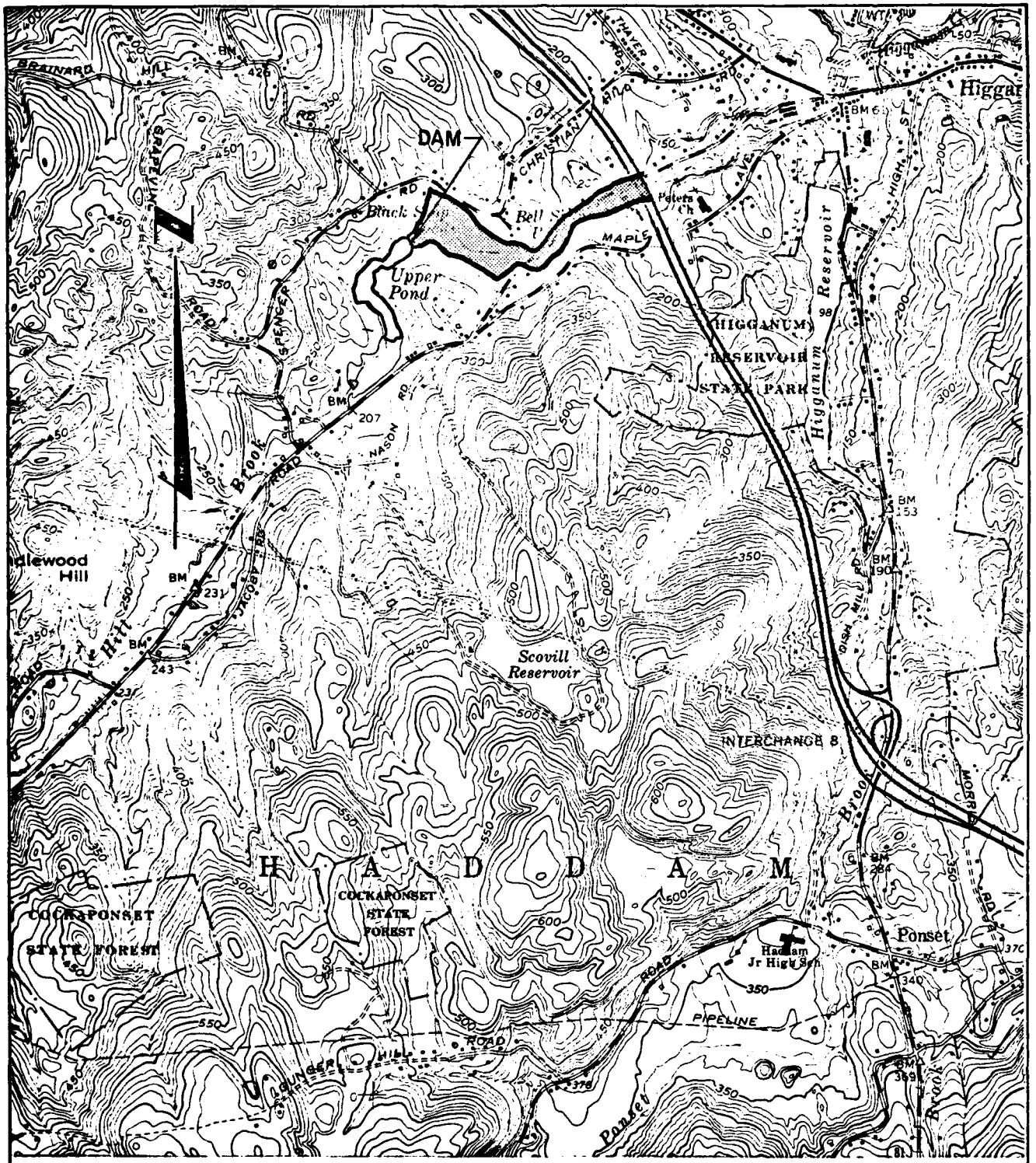


UPPER POND DAM

DRAINAGE MAP

HADDAM , CONNECTICUT

FLAHERTY • GAVARA ASSOCIATES, PC



IMPACT AREA

SCALE IN FEET

2000 1000 0 2000

UPPER POND DAM
DAM FAILURE ANALYSIS
IMPACT AREAS
HADDAM , CONNECTICUT

FLAHERTY • GIAVARA ASSOCIATES, P.C.

D-21

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY	MO	YR
CT	433	NED	CT	007	02				UPPER POND DAM	4129.5	7234.7	01	APR	80

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
	UPPER POND

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	AR	CANDLEWOOD HILL BROOK	NIANTIC	1	3000

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	(28) IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)
REPRG	1860	O	17	13	180	85

DIST OWN FED R PRV/FED SCS A VER/DATE
NED N N N N

(29) REMARKS
20-ESTIMATE 21-STONE 22-ESTIMATE 23-INDUSTRIAL

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
1	300	U	72	1730												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
APOSTLES OF THE SACRED		

(49) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
CONN DEP	CONN DEP	CONN DEP	CONN DEP

(50) INSPECTION BY	(51) INSPECTION DATE DAY	MO	YR	(52) AUTHORITY FOR INSPECTION
FLAHERTY GIAVARA ASSOCIATES	06	NOV	79	P.L. 92-367

(53) REMARKS
66= HEART OF JESUS

END

FILMED

10-84

DTIC